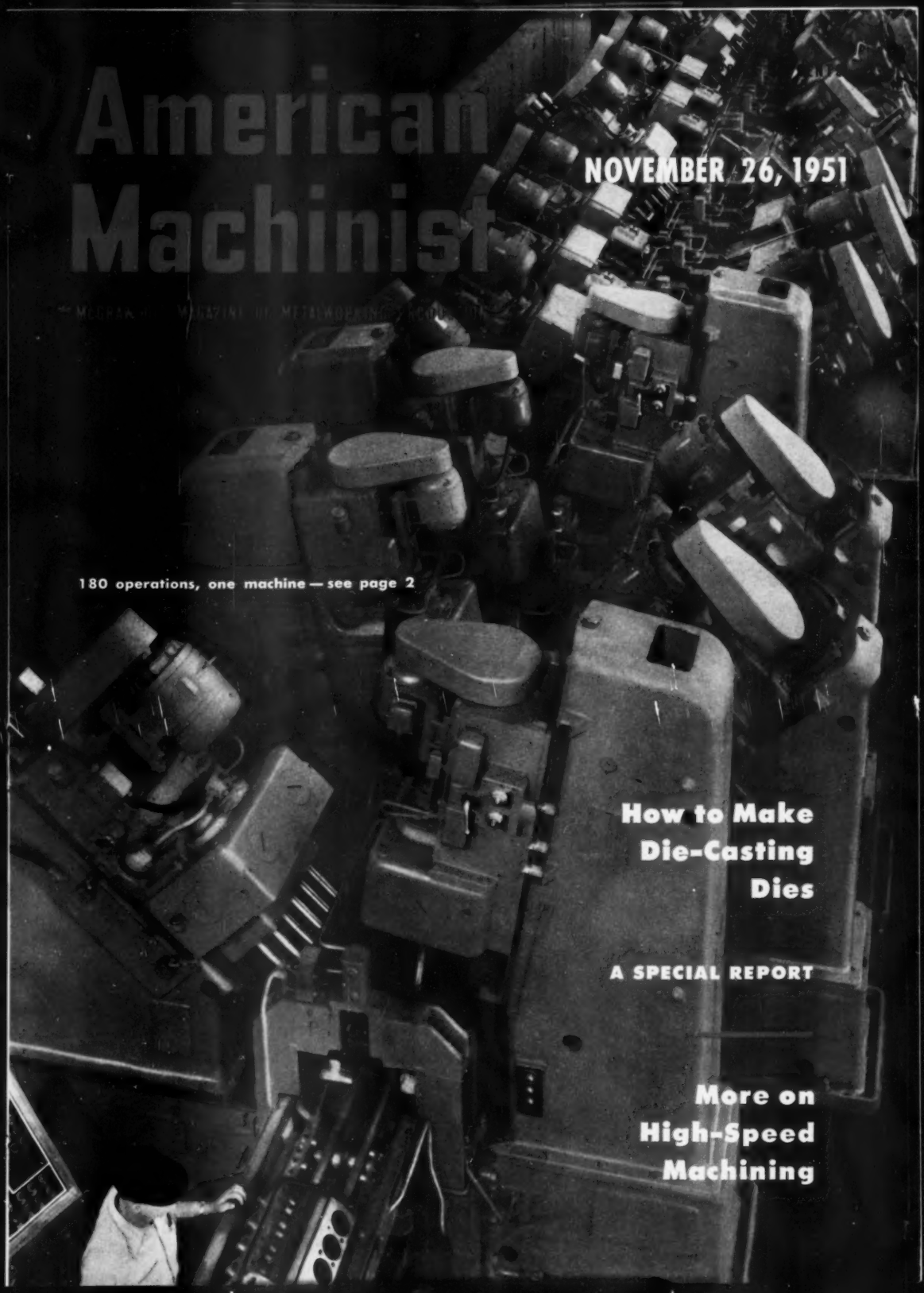
American Machinist

NOVEMBER 26, 1951

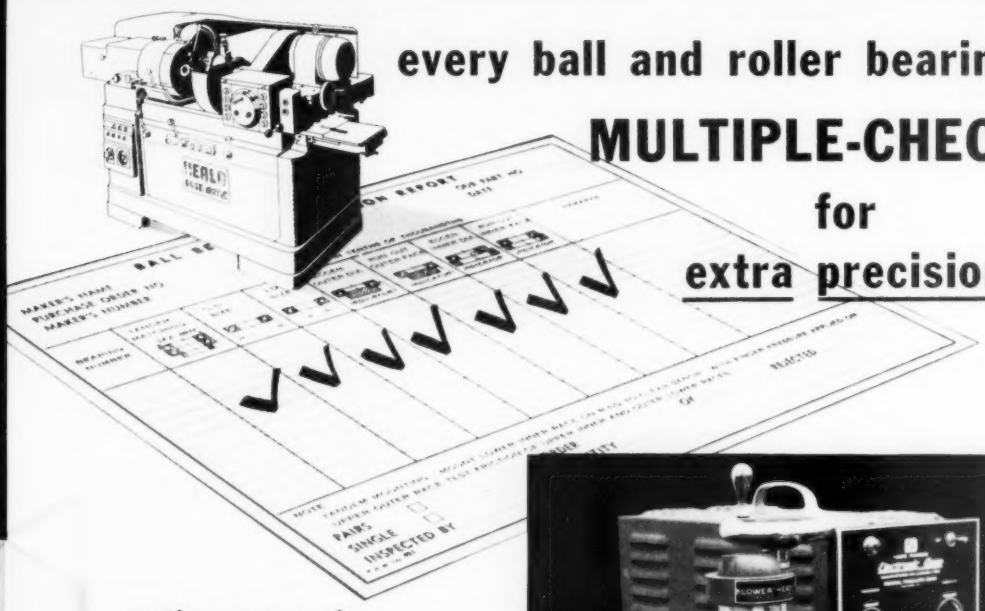


180 operations, one machine — see page 2

How to Make Die-Casting Dies

A SPECIAL REPORT

More on High-Speed Machining



every ball and roller bearing MULTIPLE-CHECKED for extra precision

...another reason why Heald machines have an important bearing on your precision production

The ball and roller bearings used in Heald equipment are specially manufactured to the most exacting specifications. Yet even that is not enough. Before use, the inner and outer races of each bearing are rigidly checked for tandem machining, O.D. size, I.D. size, O.D. eccentricity, I.D. eccentricity, runout of inner and outer bearing faces.

This extra care and precision in bearing selection is typical of the way every Heald precision finishing machine is built — from base to bridge. It's not the easiest way to build a machine. But it's certainly the best. For it all adds up to more and better production of YOUR precision finished parts.

Precision measuring set-up for checking O.D. size to millionth of an inch on anti-friction bearings prior to assembly into Heald Red Head Boringheads and Wheelheads.

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125 YEARS

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CONTENTS for NOVEMBER 26, 1951 VOL. 95 NO. 24

ADMINISTRATION

Editorial ..... *Burnham Finney* 119
Little Pitchers, Big Ears ..... *Round Table* 143

SPECIAL REPORT

Controlling Die-Casting Flash ..... *W. M. Halliday* 135

ENGINEERING

Metered Time Boosts Machine Output ..... *T. D. Rowen* 121
When Science Guides Machining ..... *E. J. Tangerman* 144
Balancing Machine Made from Turret Lathe ..... *W. R. Hufendick* 155
Transmission Roller Chain ..... *(RBS)* 163

INSPECTION

Demagnetizer Table Inspects Rubber Straps ..... *Fred Lettino* 156
Stepped Gage Classifies Studs ..... *L. Kasper* 157

MATERIALS HANDLING

Conveyors Make All Production Moves ..... *Russell M. Wicks* 130

MATERIAL CUTTING, FORMING

High-Rake Cutter Prods Production ..... *R. F. Thuma* 125
Canada Builds the Sabre Jet ..... *H. E. Linsley* 126
Shop Shots 128
A New Twist in 2-Dimensional Engraving ..... *Wm. M. Stocker, Jr.* 148
Close Controls Cut Gear Rejections 7600% ..... *Frank Petznick* 150
Multi-Spindle Automatic Reduces Job Time 70% ..... *E. L. Safford* 152
Traversing Trips Automatic Bench Lathe ..... *Ian J. Peacock* 154
Shaper Slider Indicates Tool Feed ..... *Tom Brown* 156
Toolpost Feed Corrects Bad Centers ..... *Joseph A. Wagner* 157
Maximum Grinding-Wheel Speeds ..... *(RBS)* 161

TOOLING

Flexible Gearing Linkage Operates Lathe Hobber ..... *Tom Brown* 154
Tap Aligner Works on Round Stock, Too ..... *Troy H. Main* 155
Die Scribers Simplify Layout to Duplicate Punch ..... *A. F. Wilson* 155
Roll-Feed Gage Indicates Squareness ..... *J. Henry Garneau* 156
Small Holes Drilled with Tailstock Sleeve ..... *Jack Harris* 157
Gang Vise Equalizes Small Parts ..... *Robert Mery* 158
Thin-Stock Punch Cuts Clean Holes ..... *Jack Harris* 158

NEWS OF METALWORKING

Spot News 105
Washington 107
Detroit 109
Machine Tools 111
Gaging Metalworking 115
Names in the News 172

DEPARTMENTS

Backlash 96
Reference Books Sheets 161
Talking Shop 167
Equipment Materials Parts 174
Free Literature Available 183
Round Table Discussion 204
Industrial Notes 209
Subcontracting News 217

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Chips and QUIPS

Transfer . . . Our Cover Flexichrome shows a 74-ft, 18-station transfer machine built by Greenlee Bros & Co. It handles 180 drilling, spot-drilling, rough-boring, counterboring, countersinking, and reaming operations on automotive-engine cylinder blocks. It completes 66 blocks per hr at 80% efficiency. Cycle time is 43.5 sec. Working with two similar Greenlee machines, this unit is part of a new automotive production line completing 379 machining operations in less than $\frac{3}{4}$ minute.

Alton Damon, photographer for Greenlee, made the photograph.

Conveyor Brain . . . A nerve center or "brain" through which all interdepartmental routing passes is the feature of the near-complete conveyorization at Shakeproof. Parts move to and from this center mechanically on roller and belt conveyors, and the plant is laid out on a functional basis. Russel M. Wicks, asst to the president, tells about it herewith.

Precision Shaving . . . Frank Petznick, plant manager at Ohio Forge & Machine Corp, explains his setup for processing precision gears. It features flexibility needed to produce many gear variations profitably.

Output Guard . . . Instruments are used at GE to increase the efficiency of machine use and to improve maintenance planning. T. D. Rowen of the West Lynn, Mass., plants, tells which instruments to use, and how to use them. What's more, he shows what can be done as a result of such study.

Higher Speeds . . . We have two articles in this issue on higher-speed machining, covering five or six sources of information. One combines extracts from three recent technical papers to show the extent to which science is taking over in machining, the other describes high-rake milling at Allis-Chalmers. These will repay your close study in higher production, better finishes, and greater satisfaction with your machining jobs. The first article also includes a bibliography of similar stories.

Impellers Again . . . Impellers cause machining headaches, but the aspirin for such ailments is available. We talked about machining big impellers at De Laval last April 30; now we have one on smaller ones. In pictures and captions, we show how Fairchild Stratos Div uses a special setup on an engraver for contour machining blades for aircraft cabin air conditioners.

Pictures . . . Two spreads of pictures in this issue feature aircraft production. One shows press, die, and automatic-welding jobs at Ryan Aeronautical in San Diego, the other gives highlights in building the *Sabre Jet* at Canadair.

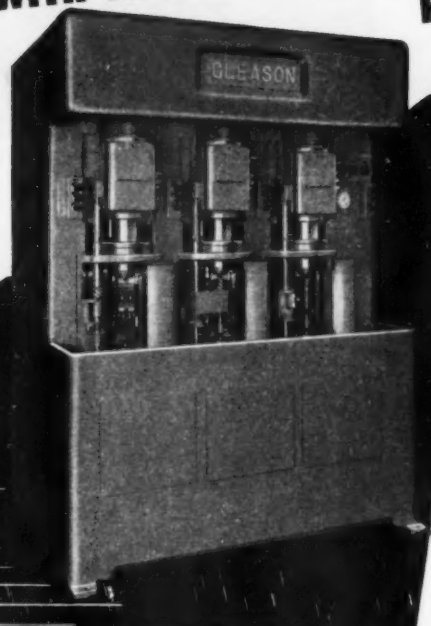
70% Cut . . . E. L. Safford, chief tool designer at The New York Air Brake Co, Watertown, N. Y., describes how reverse taper threading on a brass piece permits a new tool layout. This cut out four second operations and saved 70% of the job time. The setup, in a multi-spindle automatic, also includes an interesting pickoff operation for drilling the piece end next to the spindle.

Die-Casting Dies . . . Various readers have asked for something about design of die-casting dies. It took a little digging, but you have it in our current Special Report. W. M. Halliday, plastics and die-casting consultant of Birkdale, England, put it together for us between trips to London on a ticklish die-casting job. He's been at it quite a while, but the result justifies the effort.

Coming . . . Dec. 10 *AM* will have a much-needed Special Report on Contour Turning. There'll also be articles on pressure control in deep drawing, on an automatic lathe for oil grooves, on machining heavy weldments to close tolerances (plus a cover picture showing it), on production methods, and on equipment replacement.

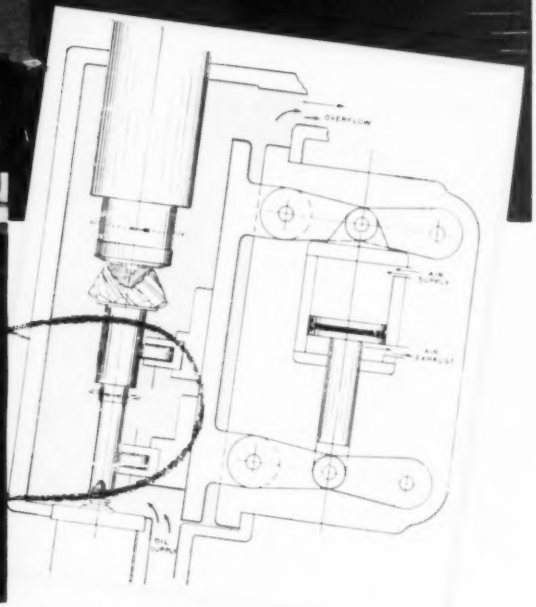
INSTRUMENTEER . . . Thomas D. Rowen, author of our lead article in this issue of *AM*, g aduated from Phillips Academy at Andover, Mass, in 1940, and from Yale University in 1943 with a degree of Bachelor of Engineering. After service with the U. S. Navy as a Lieutenant, he started working for General Electric in 1946 in the meter and instrument section at West Lynn, Mass, doing general methods work. In that division, he has held a number of positions, including that of Assistant Supervisor of Methods and Planning, and he is now on the staff of the Manager of Meter and Instrument Manufacture. Mr. Rowen lives in Marblehead with his wife and small daughter.

ELIMINATE DISTORTION
WITH THE GLEASON No. 16 PINION QUENCHING PRESS



The Gleason No. 16 Pinion Quenching Machine is a distinctively different type of quenching machine. It is designed with three multiple units, each operating independently of the other and assures continuous fast production of hardened pinions. Further straightening of shafts is unnecessary.

A pre-set metallurgically correct oil flow is provided which, when once set, makes this machine completely automatic in operation from the time the pinion is placed in the loader jaws until it has passed through the quench and returned to unloading position. During the quench, while rotating on centers, shafts are held against rollers to prevent distortion.



BUILDERS OF BEVEL GEAR MACHINERY · FOR OVER EIGHTY-FIVE YEARS · GLEASON

Write for more information on this modern way of pinion quenching.

GLEASON WORKS

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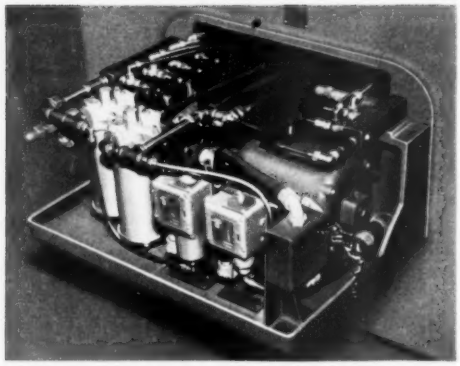
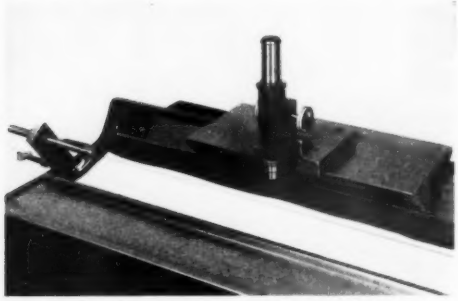
HELPFUL HINTS FOR TOPNOTCH PERFORMANCE

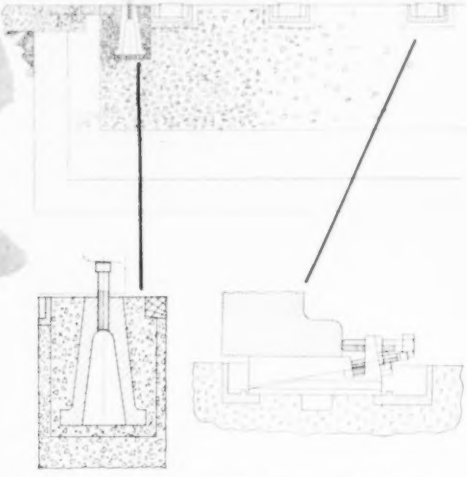
from your large CINCINNATI FILMATIC CENTERTYPE GRINDERS



Motor, pump and filters for pressure lubricating system for table and wheelhead ways.



Microscope aligning instrument for checking accuracy of table way alignment.



Anchor bolt in foundation prepared especially for the machine.

Leveling blocks should be imbedded in the concrete foundation before the machine arrives.

Big machine tools make the biggest dent in production schedules when they stop running. That's why it's so important to keep them in good condition. In most cases you can do it easily enough. Here are a few simple suggestions that will help you keep your large CINCINNATI FILMATIC Centertype Grinders—the 14" to 28" sizes—in good condition for continuous production:

FOUNDATION Adequate foundations for long precision grinding machines are very necessary. Follow the recommendations outlined in foundation plans supplied with large CINCINNATI FILMATIC Grinding Machines.

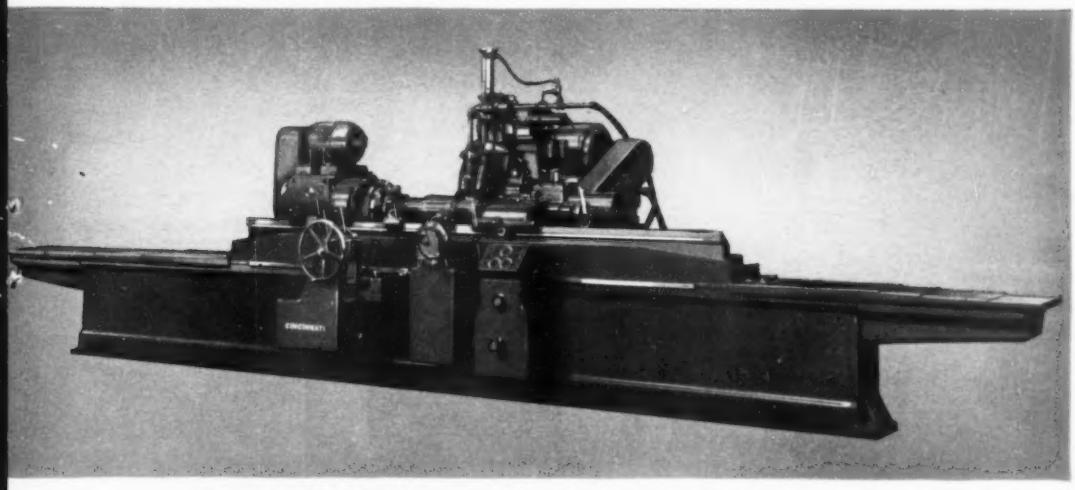
LEVELING AND ALIGNMENT Improperly leveled and aligned machines can be the source of many troubles. Wedge blocks are supplied to facilitate the leveling operation. Periodically recheck accuracy of level. When installing the machine, accurate alignment can be accomplished with the aid of a microscope aligning instrument.

LUBRICATION of your CINCINNATI FILMATIC Plain and Roll Grinding Machines is simple and easy; do not neglect it. As a reminder, make a lubrication chart and attach it to your machine.

OIL FILTERS There are three oil filters—one for the FILMATIC spindle bearing lubricating system, and one each for the table way and wheelhead way oil. All are the replaceable type. Change them periodically; once a year should be sufficient.

If you will take these simple preventive measures, you will be well repaid in accurate, dependable performance for many years . . . performance that will match the lifetime dependability of FILMATIC spindle bearings. And if you're not acquainted with the many advantages offered by the large centertype grinders built by CINCINNATI, write for literature mentioned in the caption below.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



CINCINNATI FILMATIC 16" x 96" Roll Grinding Machine, equipped with automatic wheel balancing and profile grinding wheel truing. Catalog No. G-600 contains complete specifications for the 16" Heavy Duty and 20" and 24" Plain Grinders, also the 16", 20" and 24" Roll Grinding Machines. Catalog No. G-587 covers the 20", 24" and 28" Heavy Duty Roll Grinding Machines. Write for copies of these catalogs.

CINCINNATI

GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

Pays Off!

36-Type Gear Shaper Produces in 1/3 the Time

Today's demand for quiet, accurate operation must raise the sights of all producers of gears and component gear parts. To meet precision limits in large diameter coarse-pitch gears, modern production equipment such as the all-purpose 36-Type Fellows Gear Shaper, is required.

Recently, one manufacturer replaced 5 outmoded machines with two (2) 36-Type Gear Shapers. The result—better, more accurate gears and, most important, a substantial boost in overall production.

Cost saving is obvious (as shown in the time-performance chart at right) as the result of ability to take heavy cuts at high speed and hold to close limits. Greater flexibility for handling a variety of work is present, along with improved ease of set-up, operation, and 'Change-over'.

If you've a job of precision gear manufacture up to 36" pitch diameter where cost economy and quality of output is important...a thorough investigation of the Fellows 36-Type Gear Shaper is worthwhile. Simply contact the nearest Fellows Office.

Production Performance

LARGE BRONZE GEAR (Top)

Material . . . . . High tensile bronze #3
Face width . . . . . 4 inches
Pitch diameter . . . . . 34.000 inches
No. of teeth 138
Diametral pitch 4
Former Production Time 6 hours

vs.

Production Time on 36-Type Gear Shaper . . 1 hr., 55 min.

STEEL SPUR GEAR

Material . . . . . Steel casting DW-19
Face width . . . . . 3 inches
Pitch diameter . . . . . 22.250 inches
No. of teeth 89
Diametral pitch 4
Former Production Time 10 hours

vs.

Production Time on 36-Type Gear Shaper . . 2½ hours

PHOTOS AND PRODUCTION DATA COURTESY SAMUEL M. LANGSTON COMPANY, CAMDEN, NEW JERSEY.

Fellows

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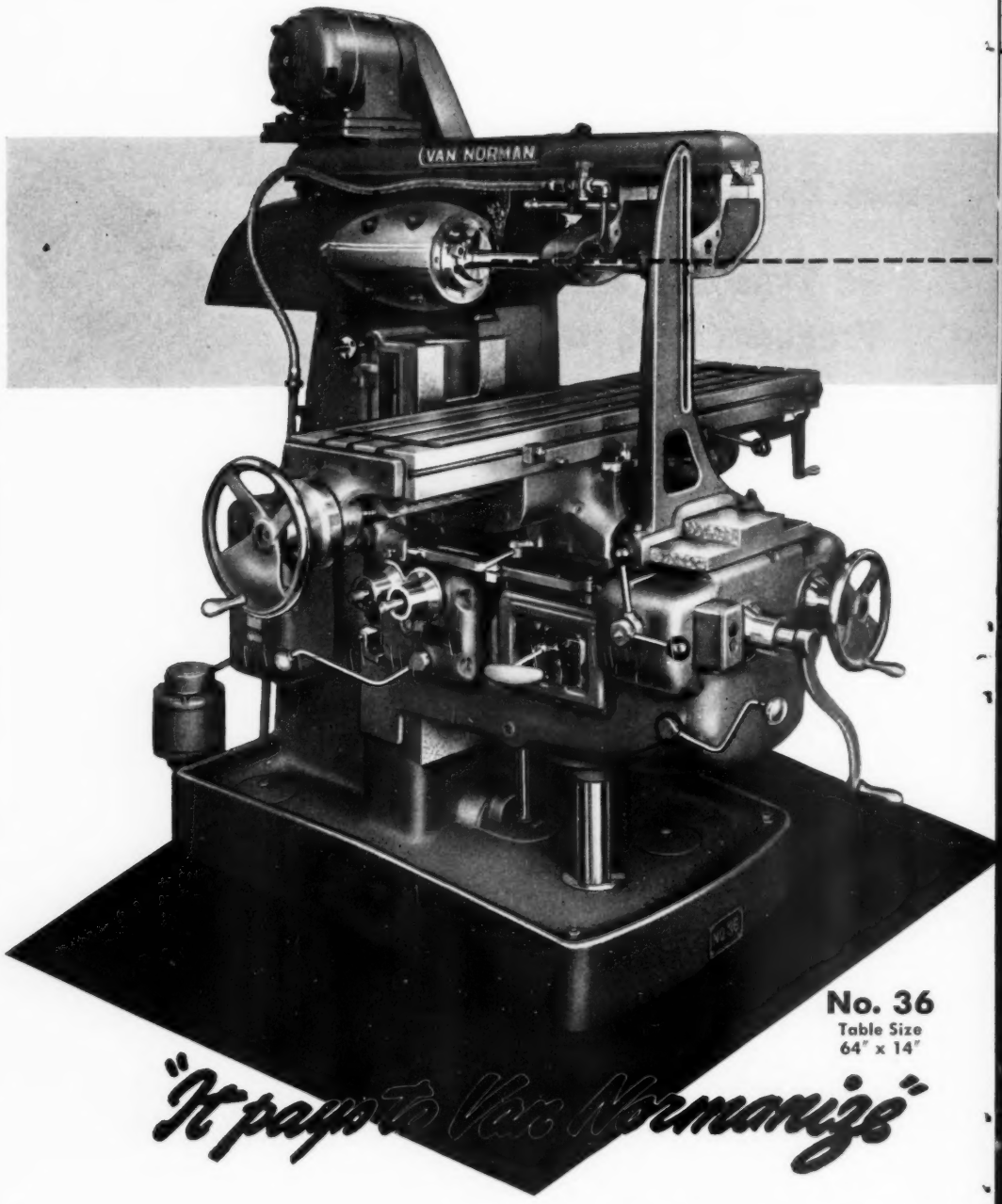
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1

ONE VAN NORMAN



No. 36
Table Size
64" x 14"

"It pays to Van Normanize"

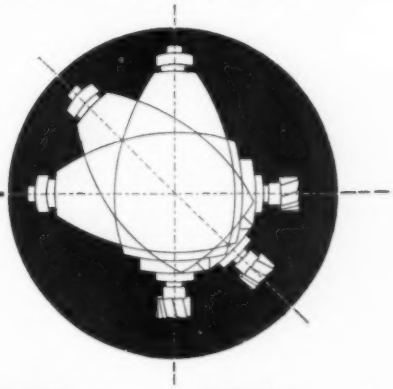
RAM TYPE MILLER

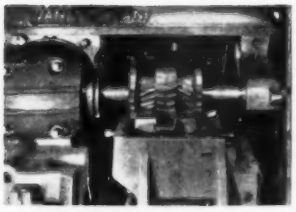
Equals

THREE SINGLE-PURPOSE MACHINES

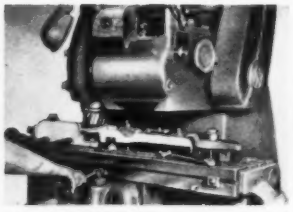
HERE'S HOW IT'S DONE WITH THE *Adjustable Cutterhead*

By merely positioning the cutterhead in the desired cutting position, the operator can perform conventional horizontal, angular and vertical milling on one machine. This feature cuts idle machine time down to a minimum . . . reduces milling costs.

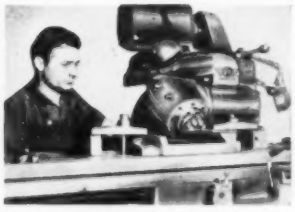




Horizontal Milling
Simply lock head in horizontal position and you're ready for horizontal milling. Ram-type overarm and outer support assures rigidity and accuracy.



Vertical Milling
With the cutterhead in vertical position and the ram extended, the operator is ready to perform conventional vertical milling. Hardened stop set at the factory assures positive 90° setting.



Angular Milling
Lock the cutterhead in any desired angular position, and you're ready for angular milling with standard cutters. The head graduated in degrees makes positioning easy.

The versatility of the Van Norman Ram-Type Millers enables you to meet the daily fluctuating milling requirements in all types of plant work. It reduces idle machine time by as much as 50%, reduces work re-setups, provides for more profitable milling at lower cost.

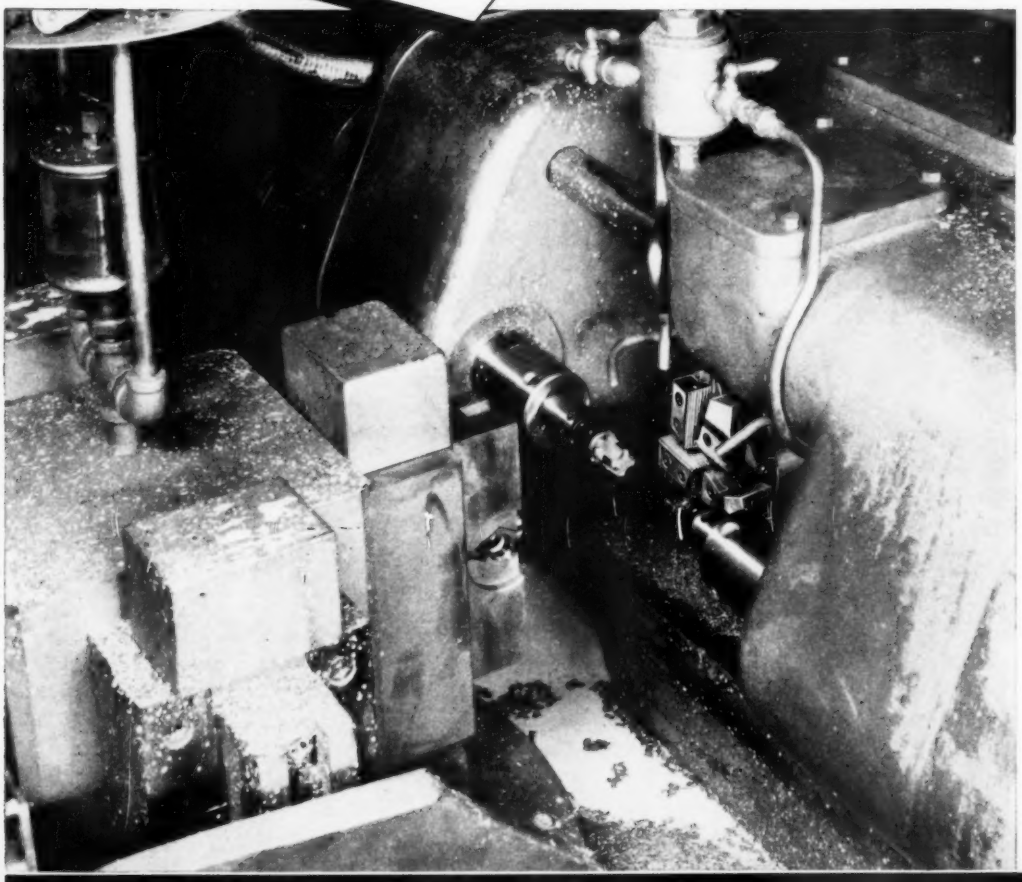
Because setups are minimized by the adjustable cutterhead, errors that often occur when the work piece is changed are eliminated. Overall milling capacity . . . horizontal to vertical . . . is always at peak efficiency

Van Norman Ram-Type Millers are simple to operate. Controls are conveniently grouped for ease of accessibility to provide maximum operator convenience. Hardened and ground steel fixed cutterhead stops permit true settings in horizontal or vertical positions. The rugged construction throughout assures accuracy and long life. Conveniently located speed and feed selectors permit quick selection of proper speed and feed.

See for yourself how these machines cut costs, improve accuracy and increase production in the tool room, machine shop, laboratory and pattern shop, as well as on the production line. Write:

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

57% LESS ...ON



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THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

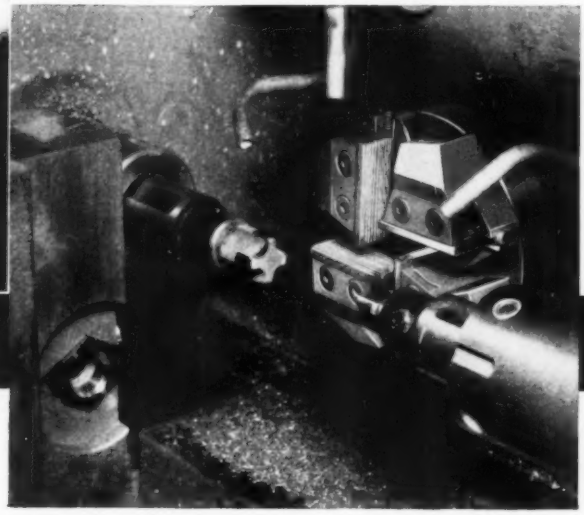
THREADING COST

AUTOMATIC CHUCKING MACHINE

A LANDIS Solid Adjustable Die Head cut the cost of one threading operation in the plant of a large Middle Western manufacturer by 57%.

The operation, performed on a Goss and DeLeeuw Automatic Chucking Machine, required the cutting of a 1-11/16" diameter 14 pitch thread ½" long on cast brass valve bodies. Prescribed tolerances were easily maintained.

The LANDIS Head fit perfectly into the highspeed cycle of the chucking machine, and produced an average of 210 finished pieces per hour, revolving at 385 RPM. Major factors in the efficiency of this LANDIS Head were low down-time and low tool cost, occasioned by long tool life. Output of finished pieces averaged from 4,000 to 5,000 between chaser grindings.



Please send job and machine specifications with your request for additional information.

LANDIS TRADE MARK REG. U.S. PAT. OFF.

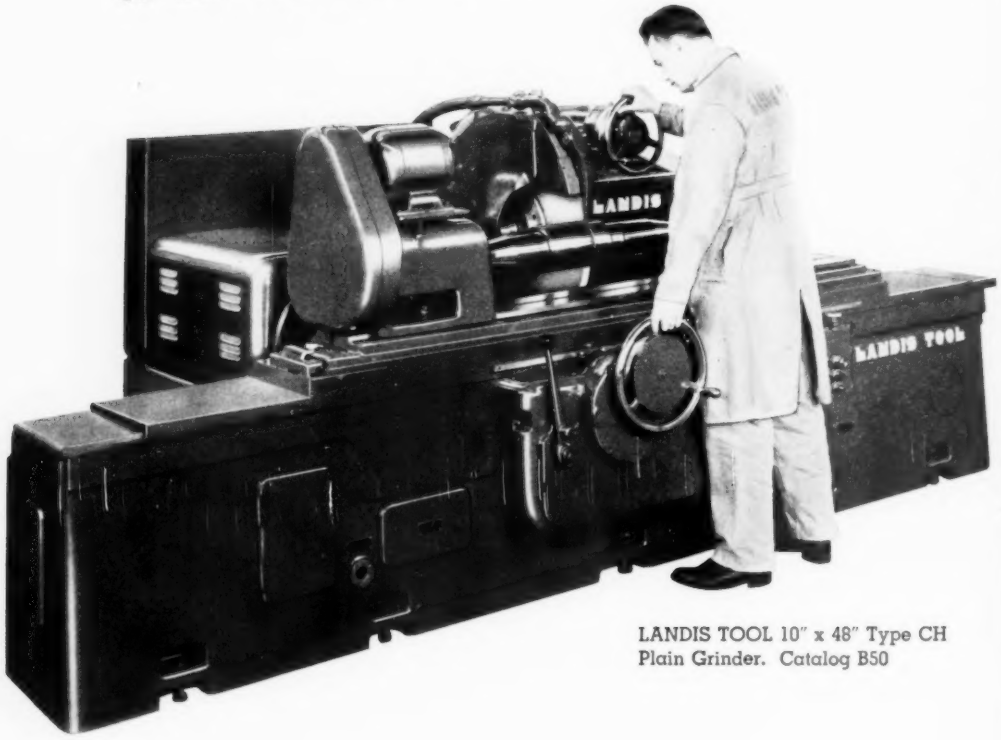
WAYNESBORO PENNSYLVANIA

GENERATING EQUIPMENT

AUTOMATIC WAY LUBRICATION FOR GRINDER

REDUCES DOWNTIME — STEPS UP

on new **LANDIS TOOL** 10" - 14" plain grinders



LANDIS TOOL 10" x 48" Type CH
Plain Grinder. Catalog B50

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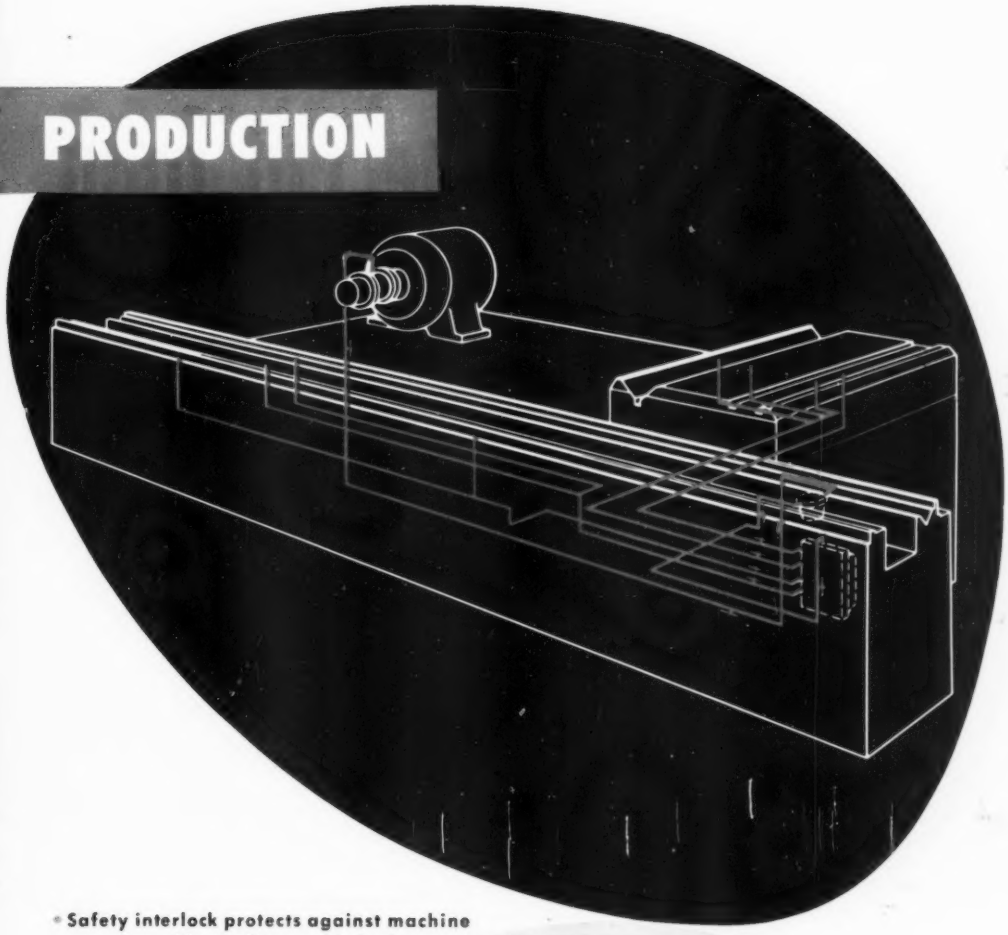
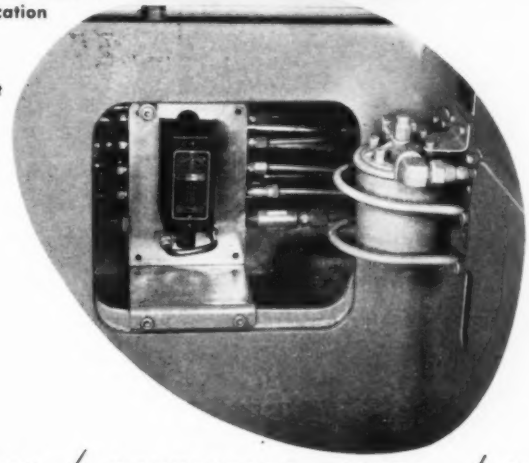
Precision Grinders

Send us your work prints for production estimates. Find out on one of your own jobs how LANDIS TOOL Plain Grinder features can increase production for you.

PRODUCTION



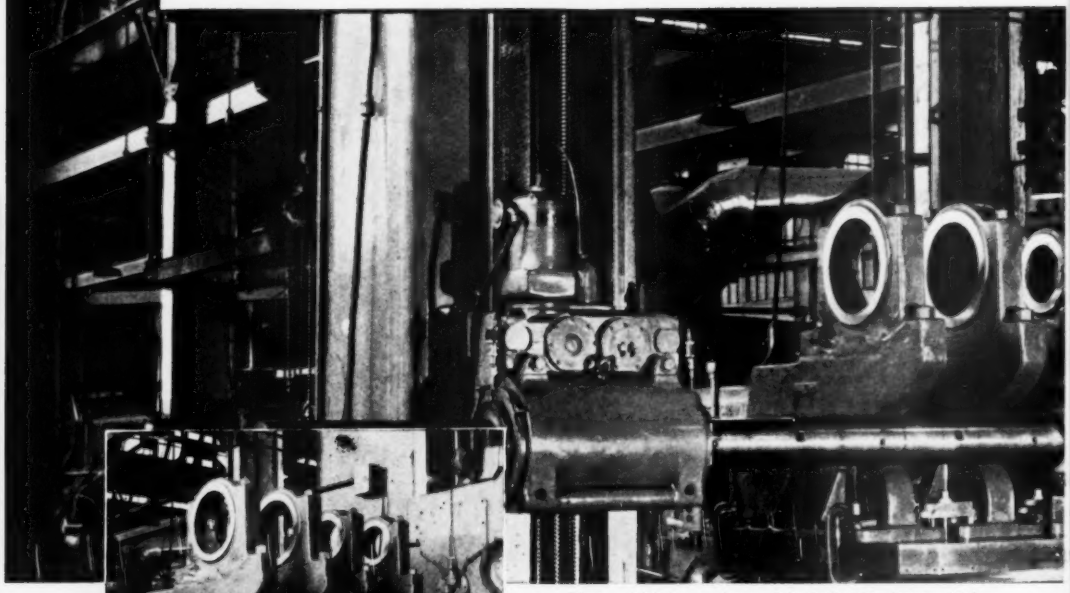
- Safety interlock protects against machine operation without adequate lubrication pressure for ways.
- Separate pump, reservoir and filter for ways enables use of best lubricant.
- Pressure way lubrication provides uniform oil film.
- Telescoping covers protect ways from damage by dirt and chips.

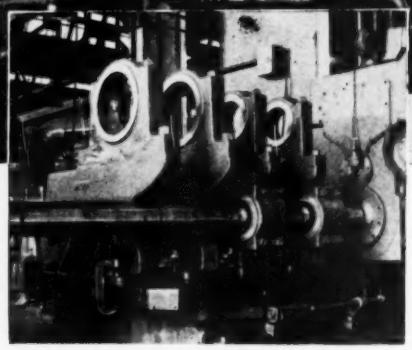


LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U. S. A.

Machine time cut from

ON COMPLEX TROUGH STAND FOR





Close-up of finish boring operation on bearing seats. Note rotary table used to rotate workpieces—reduce setups.

Photos and job data — Courtesy Baker-Perkins Co., Saginaw, Mich.

The former time for this job was 24 hours. Then a G&L Job Analysis was made. Result — a 560-T (6" Table Type) G&L Horizontal Boring, Drilling and Milling machine was recommended — together with a G&L rotary table. Now the user sets up workpieces two at a time — and using only three setups completes 4 parts and completes the job in 12 hours . . . at 50% savings in time alone!

GIDDINGS & LEWIS

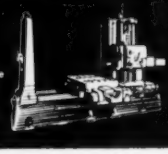
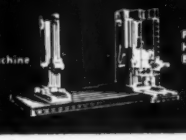
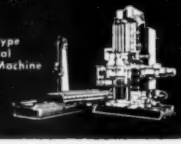
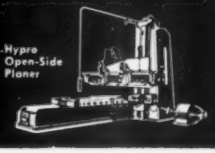


Table Type Horizontal Boring Machine

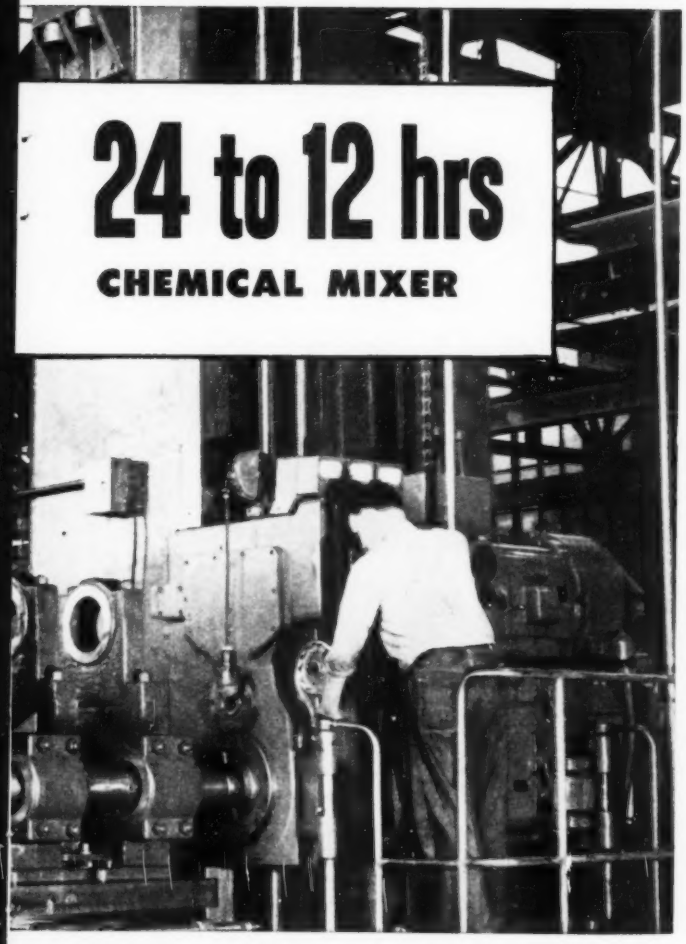

Floor Type Horizontal Boring Machine


Planer Type Horizontal Boring Machine


Hypro Open-Side Planer

24 to 12 hrs

CHEMICAL MIXER



You'll find that regardless of the part or parts . . . big or little — simple or complex, you'll save time and money with the G&L line. Maybe you will want a G&L Horizontal Boring, Drilling and Milling Machine — or a G&L Hypro Planer, Planer-Miller or Vertical Boring Mill . . . but whatever your need, you can be sure that G&L's unbiased Job Analysis Service will give an answer that will mean savings to you. See our nearest representative or write direct. Get the facts about a G&L Job Analysis today — there's no obligation . . . and DELIVERY ON G&L's MACHINES . . . MIGHT BE BETTER THAN YOU THINK!

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

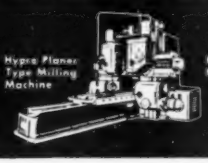
5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L or its nearest representative today. Get the facts on your needs — your problems. Get a G&L unbiased Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

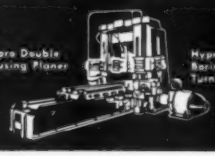
How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

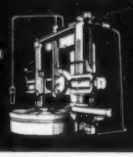
MACHINE TOOL CO.



Hypro Planer Type Milling Machine



Hypro Double Housing Planer

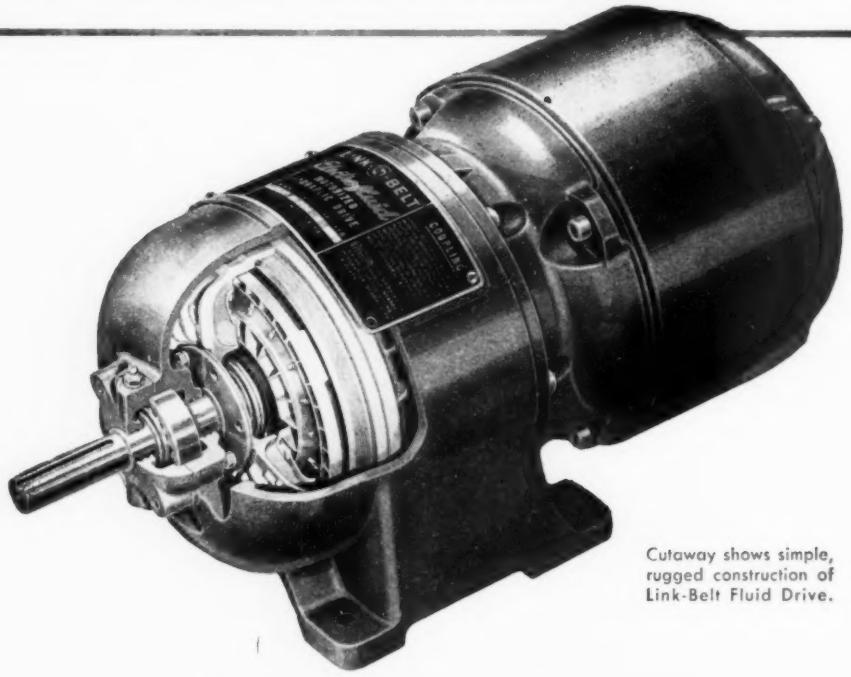


Hypro Vertical Boring and Turning Mill

G&L HYPRO

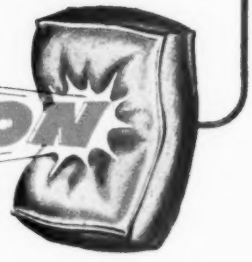
FOND DU LAC WISCONSIN

Save machinery wear and tear



Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

LINK-BELT Electrofluid Drive with constant CUSHION ACTION



Here's why your machinery and motors last longer with CUSHION ACTION —

SMOOTH ACCELERATION — CUSHION ACTION smoothly and gradually loads the motor even on heavy inertia loads. Motor approaches maximum torque before output shaft revolves.

OVERLOAD PROTECTION — Even if driven machine jams, rotor inertia is isolated. Torque applied is limited to fluid drive capacity — no need for mechanical break-pins.

SHOCK ABSORPTION — CONSTANT CUSHION ACTION minimizes shocks and torsional vibrations. That means longer life for your motor and driven equipment. And because shock load service factors can be disregarded, you can use smaller, less expensive power transmission equipment.

LOW STARTING CURRENT — Motor starts instantly — accelerates to 70% of full-load speed before engaging load — takes less than half normal starting current with less heating.

HIGH STARTING TORQUE WITHOUT OVERPOWERING — Because motor accelerates free of load, it reaches maximum pull-out torque that might otherwise require a special type of oversize motor.

The Link-Belt Electrofluid Drive comes to you in a "packaged" unit with NEMA mounting and shaft dimensions to facilitate ready installation. Book 2485 has complete information on five types of Link-Belt Fluid Drives — Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive.

LINK-BELT

FLUID DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12,317

GARDNER

precision disc Grinders

40 Thin Steel Lock Plates Ground Per Minute

Grinding back or edge
1 3/8" wide, 2 3/16" long, 3/16" thick
Tolerance .004" for uniformity

NO. 223-23" SINGLE SPINDLE GRINDER
Special rotary work carrier
Hand loaded . . .
automatically unloaded

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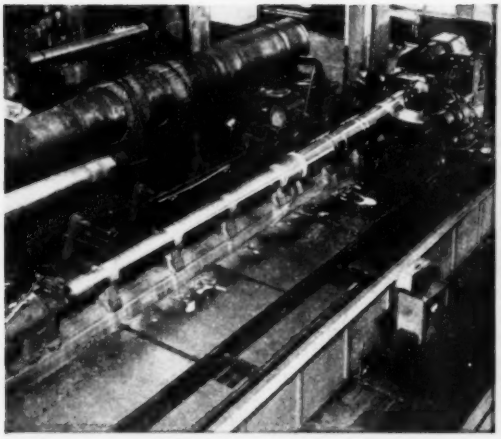
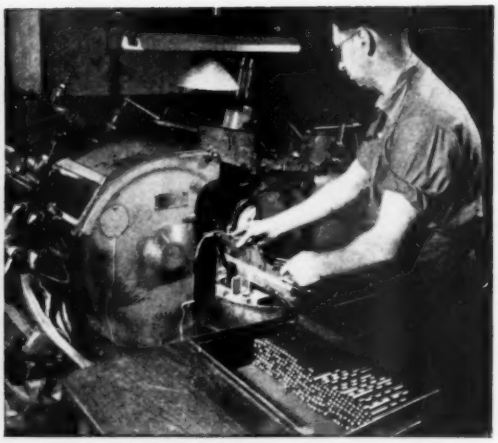
GARDNER MACHINE COMPANY
410 Gardner Street • Beloit, Wis.

Write for Catalog



Grinding an ordnance part on the world's longest cylindrical grinder. On big jobs like this, where spoilage is so costly, the correct Norton wheels assure you the most consistently accurate results.



A plunge-cut grinding job on a centerless grinder, showing use of a hand-operated sliding work rest. Units being ground are high speed steel drills, for which wheels of Norton ALUNDUM* (fused alumina), in the correct grain size and grade, give best results.

In Your *Cylindrical* or

It's easier to GET MORE UNITS { *per dressing* / *per hour* / *per wheel*

WITH NORTON O. D. GRINDING WHEELS

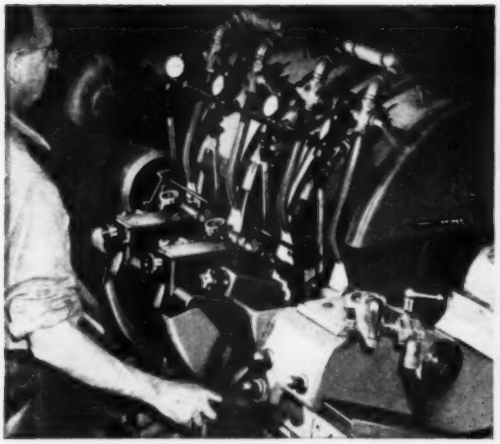
You want your cylindrical or centerless grinding wheels to produce exactly the required tolerances and finish . . . in piece after piece . . . hour after hour . . . with a minimum of dressing or replacement.

With Norton wheels it's *easier* to get these results. Here are the reasons:

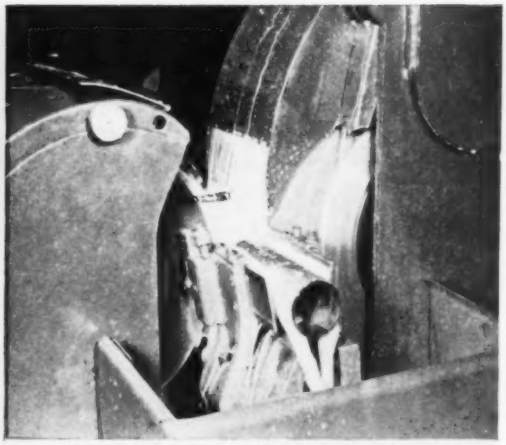
1. Norton Range of Specifications Covers All Your O. D. Jobs. Whatever your material or job specifications — in the *complete* line of Norton wheels for O.D. grinding you're sure to find the *one* wheel with the *right* combination of abrasive grain type and bond for top cutting performance and extra long wheel life — and Norton uniformity assures this top performance in *every* wheel.

2. Norton Applicational Aid Covers Your Grinding Problems. In practically every case your Norton Distributor can quickly tell you which types of wheels you need. Backing him is the Norton Abrasive Engineer in your area. And behind both is the Norton technical staff, representing the resources and know-how of the world's largest manufacturer of abrasives.

3. Norton Stocks Cover Your Delivery Requirements. Your Norton Distributor keeps ample stocks of popular O.D. wheel types and sizes. Larger stocks are maintained in Norton warehouses in key cities throughout the country, and you can always count on prompt shipments from Norton Company's complete stocks in Worcester.

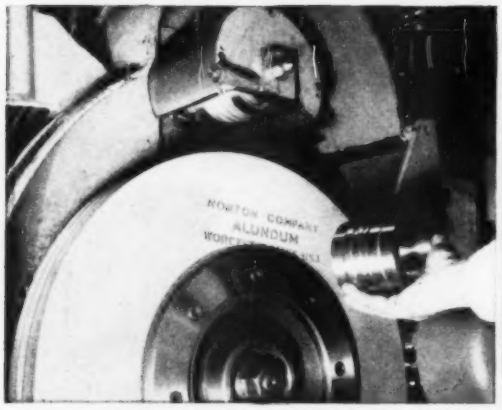


Cylindrical grinding of four diameters at once. Here, close uniformity of wheels is vital — another good reason for choosing Norton grinding wheels with their proved ability to grind multiple diameters to exactly uniform size with a minimum of dressing.



Through-feed grinding of hollow tubing in a centerless machine. Norton wheels are your best bets for peak production and quality in O.D. grinding — on every type of material, from softest aluminum to hardest steel.

Centerless Grinding...



Shaping a wheel by crush truing, with hardened steel crusher roll shown in raised position. Both Norton ALUNDUM* and CRYSTOLON* wheels can be crush trued, to give excellent results in this rapidly growing method of grinding intricate O.D. contours.

This handy, illustrated booklet gives you the essential facts of cylindrical and centerless grinding, answering many questions and providing convenient selection charts. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

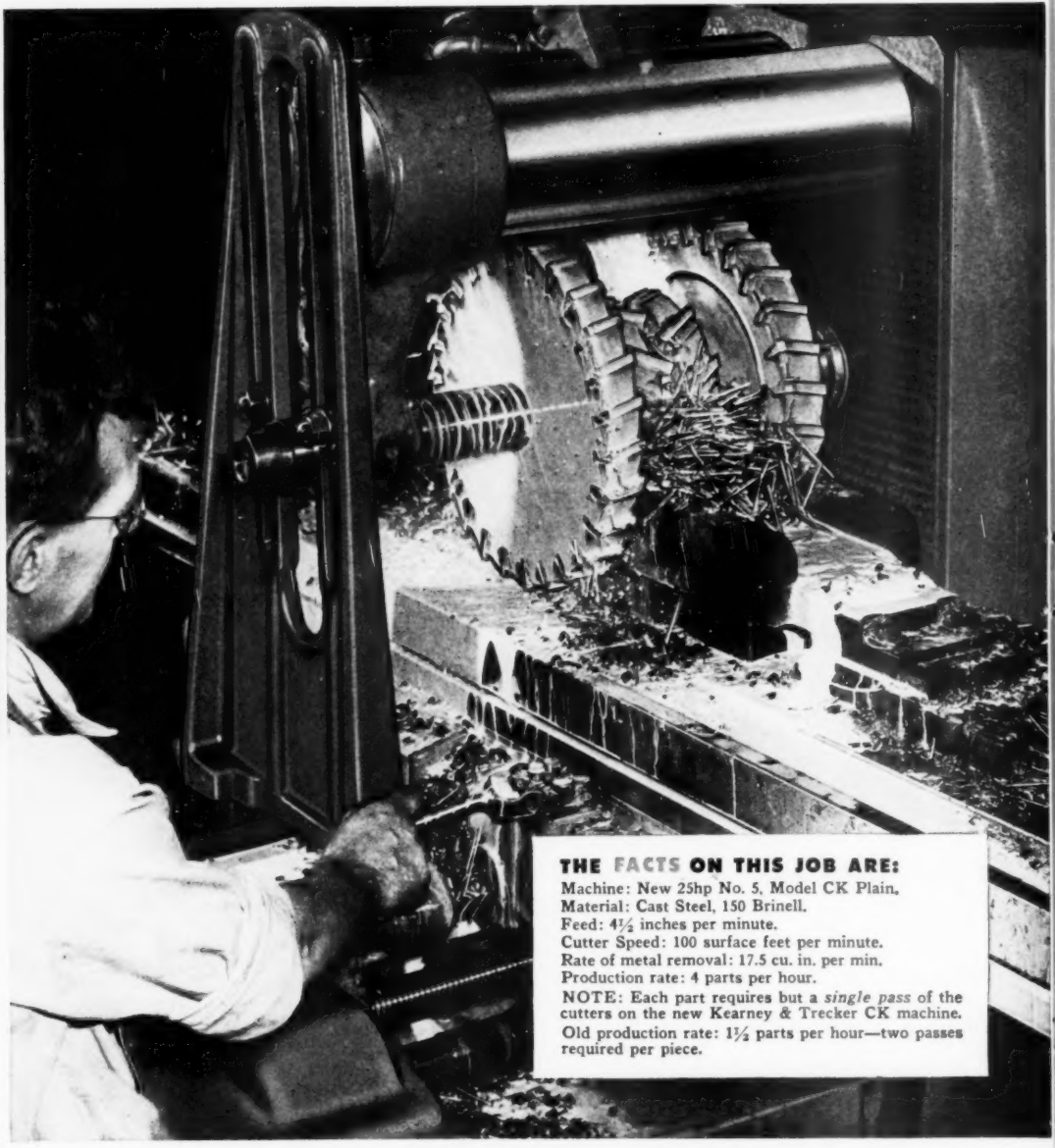
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products to make other products better

facts tell the story { NEW CK USER BIG

KEARNEY & TRECKER MILWAUKEE



THE FACTS ON THIS JOB ARE:

Machine: New 25hp No. 5, Model CK Plain.
Material: Cast Steel, 150 Brinell.
Feed: 4½ inches per minute.
Cutter Speed: 100 surface feet per minute.
Rate of metal removal: 17.5 cu. in. per min.
Production rate: 4 parts per hour.

NOTE: Each part requires but a *single pass* of the cutters on the new Kearney & Trecker CK machine.

Old production rate: 1½ parts per hour—two passes required per piece.

MILLING MACHINE PAYS PRODUCTION DIVIDEND

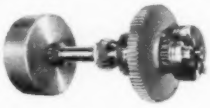
NEW 25HP CK PLAIN MACHINE OUT PRODUCES PREVIOUS MACHINE NEARLY 4 TO 1!

CK MILLING MACHINE FEATURES THAT HELPED DO THIS JOB BETTER

Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

CK's positive, metered pressure and automatic lubrication assured cool, wear-free operation in spite of heavy cutting load.

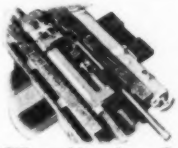
No. 60 heavy-duty drive flange around spindle nose permitted use of an extra-rigid heavy-duty arbor on this multiple cutter setup.



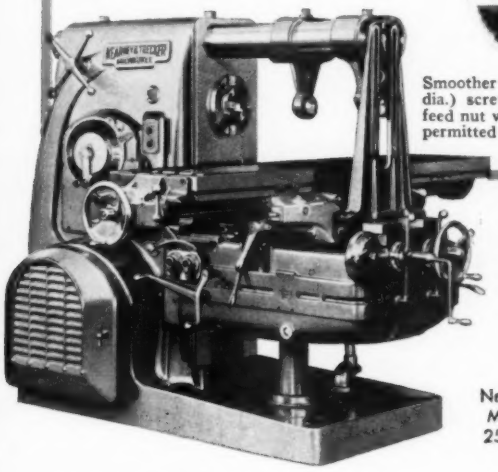
CK's 3-bearing spindle and flywheel assure Maximum Cutter Efficiency. On this job it meant fast metal removal and smooth finish in a single pass.

The new Kearney & Trecker CK milling machine doing this job has 24 different spindle speeds (13 to 1300 rpm.) Its 32 different table feeds range from ¾" to 90" per minute. Thus operator was able to *pick exact speed and feed* to get fullest advantage from high horsepower and modern cutting tools. This meant Greater Productivity on this job.

Smoother Feed of CK's large (2" dia.) screw and extra-long table feed nut with backlash eliminator permitted heavy cut.



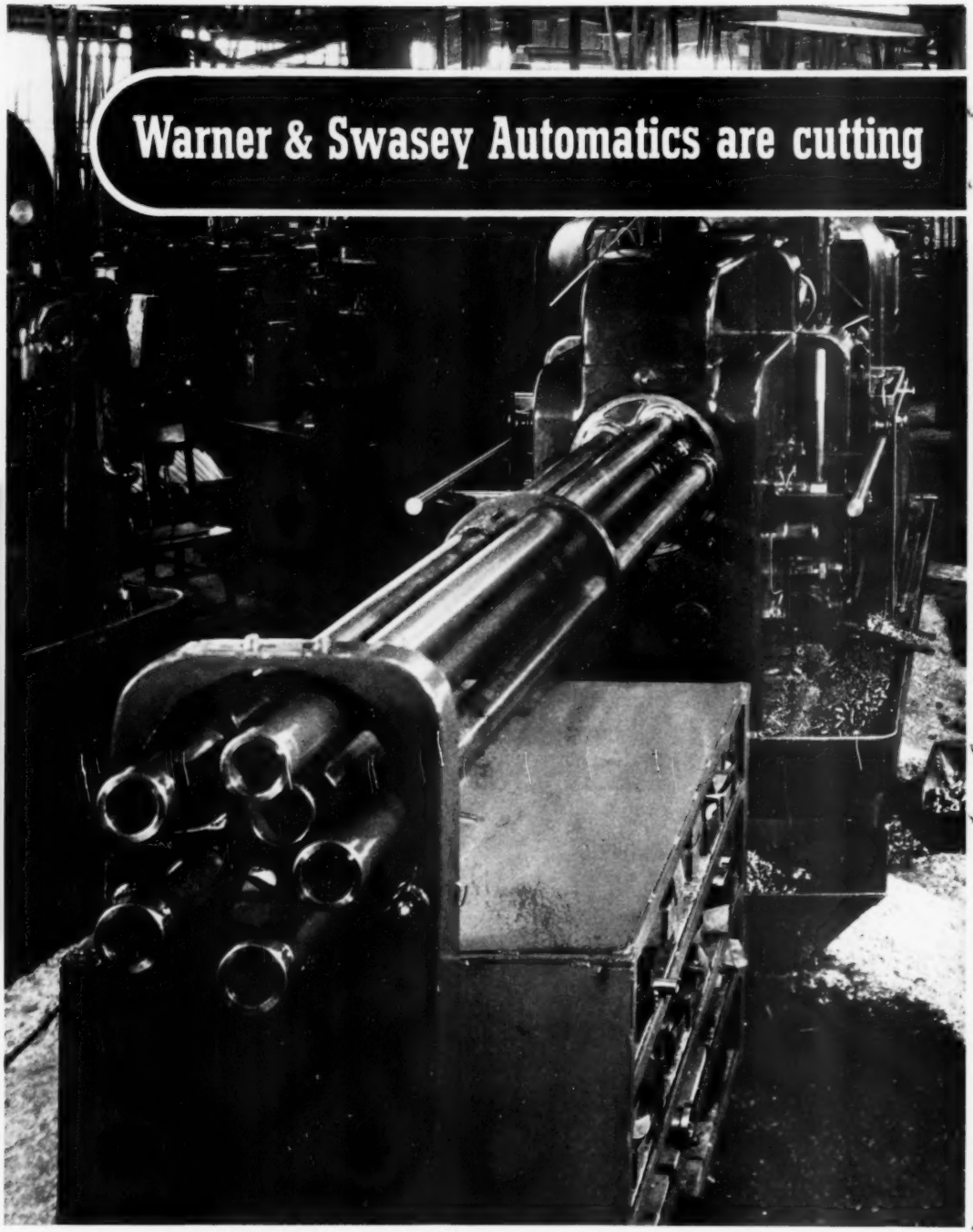
New CK machines have Greater Horsepower. On this job, 25hp enabled operator to get maximum production from his cutters.



New No. 4 Model CK 25hp Plain

Investigate the new CK line of milling machines. You'll find every feature is test and job-proven to give you cost-cutting results . . . greater machine capacity, productivity and better finished products. Contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

Warner & Swasey Automatics are cutting



Warner & Swasey 5-Spindle Automatic Bar Machines in operation at Colson Corporation, Elyria, Ohio

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER & SWASEY

costs for Colson Corporation

Nationally known manufacturers of Casters, Material Handling Trucks, etc.

the Colson story

- Setup time cut more than 50% on new Warner & Swaseys.
- Production up 7 to 8 times on lots of 500 to 10,000 pieces.
- "Progressive" setups are much more practical on Warner & Swaseys.
- Small lots are economically practical on this new CAMLESS Automatic.
- Machine operators appreciate easy access and interchangeability of tooling.
- Both management and operators approve—NO CAMS TO CHANGE.
- Five repeat orders prove the profitability of Warner & Swaseys.

WARNER & SWASEY
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS AND TAPPING MACHINES

MORSE
Want "Sure-Shot" Production?

Then Remember—

MORSE QUALITY

. . . in every type of cutting tool . . . is sold only by your

MORSE-FRANCHISED DISTRIBUTOR

MORSE MEANS *MORE* PRODUCTION . . . smoother, more accurate production . . . with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials."

And Morse Quality is steadily being advanced by Morse Engineering and Research . . . as you would expect of the company that originated and developed the twist drill.

That's why, on every cutting tool order, it's good business to specify "MORSE" and shoot it in to your Morse-Franchised Distributor. And if you want still *higher* production, specify "MORSE Electrolized."

Morse Twist Drill and Machine Co., New Bedford, Mass. (Div. of Van Norman Co.)
Branch Warehouses in New York, Detroit, Chicago, Houston, San Francisco

MORSE

DO NOT
LUBRICATE
Life-Line motor
PAIRED FOR PRODUCTION
Life-Linestarter

Exposed?

These two retard corrosion's bite

Splashing liquids, outdoor service, chemical fumes. You'd have to look a long time to find a motor and starter that take this kind of corrosive service as well as the matched Life-Line chemical motor and Life-Linestarter®.

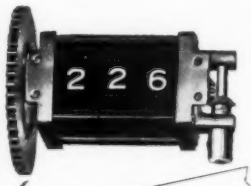
The special enclosures of Life-Linestarters are extra protected to ward off corrosion. Castings are sprayed with iron-oxide, zinc-chromate primer; then, finished with aluminum lacquer. A neoprene gasket between covers seals out corrosive elements.

Inside, too, parts are extra protected. All steels are cadmium plated . . . contacts are pure silver . . . coil laminations, treated with protective film, then double coated with aluminum paint. These kinds of extras have made the Life-Linestarter outstanding for chemical service.

The Life-Line chemical motor has also proved itself best for chemical service, for more than one reason. Bonderized® steel frame and brackets don't give corrosion a chance . . . have outlasted conventional motors. Sealed bearings guard against acid, dirt, moisture. Windings, extra protected by multiple layers of Thermoset varnish, stand up to extreme corrosive conditions. Enclosures, too, make sure vital parts are fully protected.

This extra protection . . . this extra life you get with Life-Line motors and Life-Linestarters is available to you at *no extra cost.* Simply specify Life-Line motors and Life-Linestarters on your next job. Ask your Westinghouse representative for complete information on this production team. He has the answers. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21627

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS



Small Component... or Complete Unit... You* can count on getting whatever You* need—

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This REEL CONTROL BOX, complete with its *built-in* counting mechanism, indicates the number of feet of antenna reeled in and out of certain types of military aircraft. Manufactured completely by Veeder-Root, including outside bakelite cover and box, this unit shows another imaginative application of the universal language of direct-reading *Count*rol.

Now if you, *in any of your defense work,** have a counting problem, then you can count on Veeder-Root to help you in every possible way.

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN. • GREENVILLE, S.C.
Montreal 2, Canada • Dundee, Scotland
Offices and agents in principal cities

"Counts Everything on Earth"

"CATERPILLAR"

+ "American"

A coalition of outstanding "name" products dedicated to the interests of industry.

Here is a "Caterpillar" Diesel DW20 Tractor with W20 Wagon loading heavy clay for the Garza-Little Elm Dam near Lewisville, Texas.

The astonishing ease of operation of these units due to their ultra-modern design makes the "load" lighter and the cost lower.

For the very same reason "Caterpillar" uses many "American" Radials. Because of their ultra-modern design they make the drilling, boring and tapping "load" lighter in "Caterpillar" plants and keep the cost of production at a minimum.

Extra power, centralized control, boring mill type spindle and extra fast tapping are outstanding virtues of "American" Hole Wizard Radials which swell the operator's pay envelope and help keep production on a profitable plane.

For more work, better work and lower cost work, get the facts about "AMERICAN".

Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

To meet every INDUSTRIAL X-RAY NEED

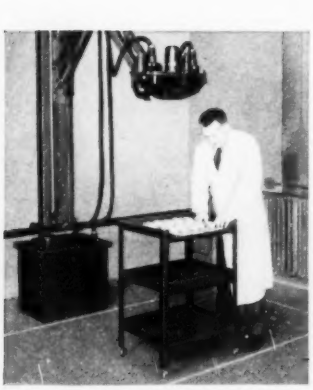
There's no need to improvise or compromise when you buy a General Electric Industrial X-Ray Unit. The comprehensive GE line makes possible the selection of just the right unit to match the type of inspection desired throughout your manufacturing process.

More than a half century of x-ray development, including the pioneering of industrial x-ray apparatus, is reflected in this highly versatile array of industrial x-ray units. Chances are, there's a need for x-ray in your business. Lower your production costs and improve quality. Let one of General Electric's highly-trained application specialists appraise your inspection needs. For full information write — X-Ray Department, General Electric Company, Milwaukee 14, Wisconsin, Box AB-11.

You can put your confidence in —

GENERAL ELECTRIC

XRD-3—This x-ray diffraction apparatus provides for the use of modern techniques for the study of crystal structures and the relation of these structures to the physical properties of nearly all solid materials.

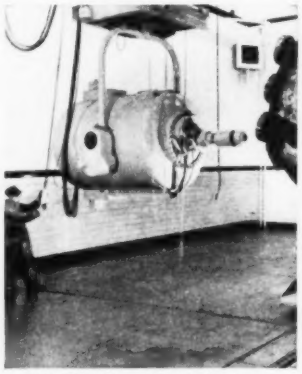


OX-140 — Extremely versatile and efficient . . . with a continuous operating range of from 30 to 140 kvp at 5 to 10 ma. Available in six different models. Invaluable for inspection of low-density metal and other materials.

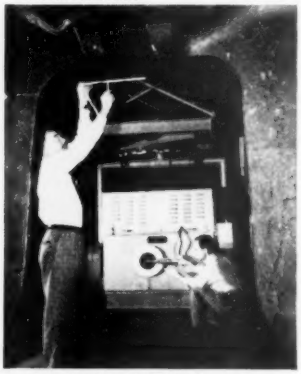
OX-250 — The world's most popular industrial x-ray unit . . . with an operating range from 60 to 250 kvp, 2.0 to 10.0 ma. This rugged unit is available in seven different mountings to meet varied industrial needs.

OX-400 — Bridges the gap between low and high-voltage equipment. Where cost prevents installation of higher-voltage equipment, yet penetration of lower-voltage units is insufficient, this 400 kvp apparatus is a natural choice.

RESOTRON 1000 — The million-volt unit which opened a new era in industrial radiography. Featuring a resonant transformer, multi-section tube, and gas insulation, it operates at 1000 kvp, 3.0 ma, continuous rating.

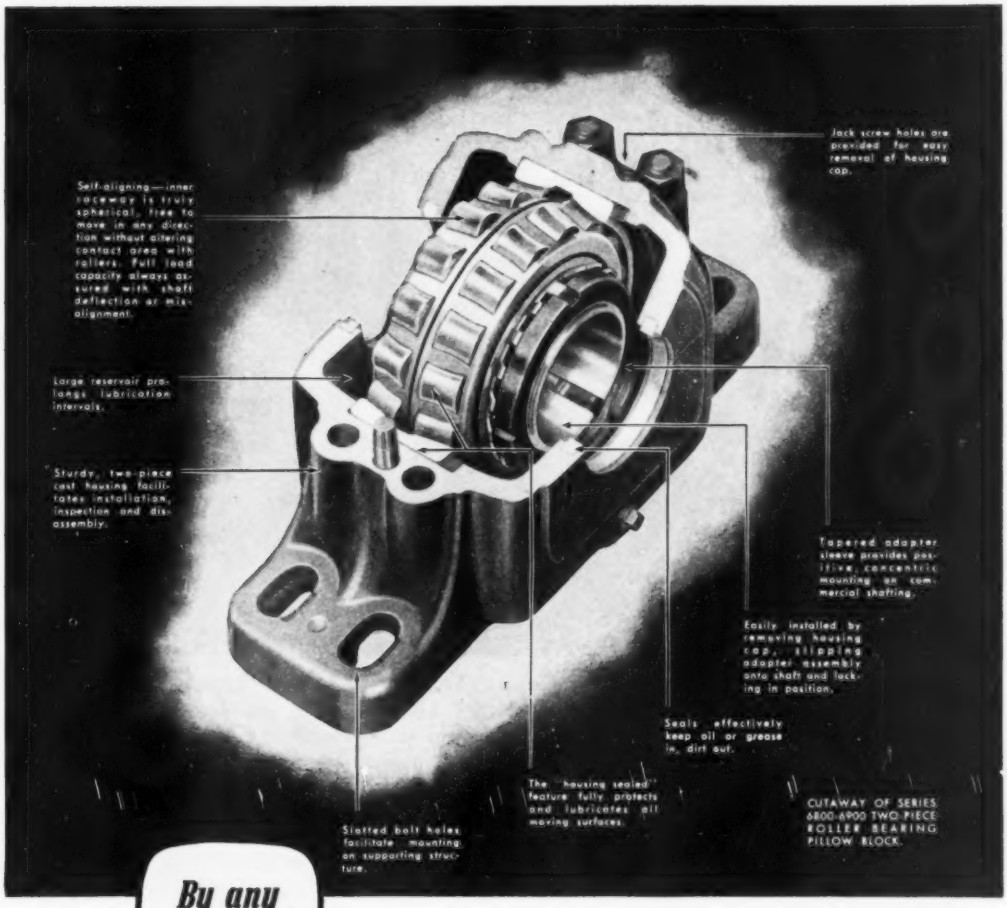


RESOTRON 2000 — As with the Resotron 1000, this two-million volt unit permits the use of the large-field, reflected x-ray beam for simultaneous radiography of many objects in a single exposure . . . Faster, with greater penetrating power.



15 MILLION-VOLT BETATRON — The present-day ultimate where maximum sensitivity is paramount. Your best choice in magnetic accelerators, for speed, sensitivity, and field size for the radiography of heavy-section thicknesses.

LINK-BELT Ball and Roller Bearings smooth the path of power


Jack screw holes are provided for easy removal of housing cap.
Self-aligning—inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured with shaft deflection or misalignment.
Large reservoir prolongs lubrication intervals.
Sturdy, two-piece cast housing facilitates installation, inspection and disassembly.
Tapered adapter sleeve provides positive, concentric mounting on commercial shafting.
Easily installed by removing housing cap, slipping adapter assembly onto shaft and locking in position.
Seals effectively keep oil or grease in, dirt out.
The "housing sealed" feature fully protects and lubricates all moving surfaces.
Slotted bolt holes facilitate mounting on supporting structure.
CUTAWAY OF SERIES 6800-6900 TWO-PIECE ROLLER BEARING PILLOW BLOCK.

By any standard . . . **LINK-BELT ball and roller two-piece housing facilitates mounting assembly**

Mounting Link-Belt two-piece housing pillow blocks to your assembly is a quick, easy job. The dowel pin holes are tapped so that a standard threaded bolt can serve as a jack screw to raise the cap for installation. Then just slip the adapter assembly onto the shaft and lock securely into position. There are many other Link-Belt design advantages.

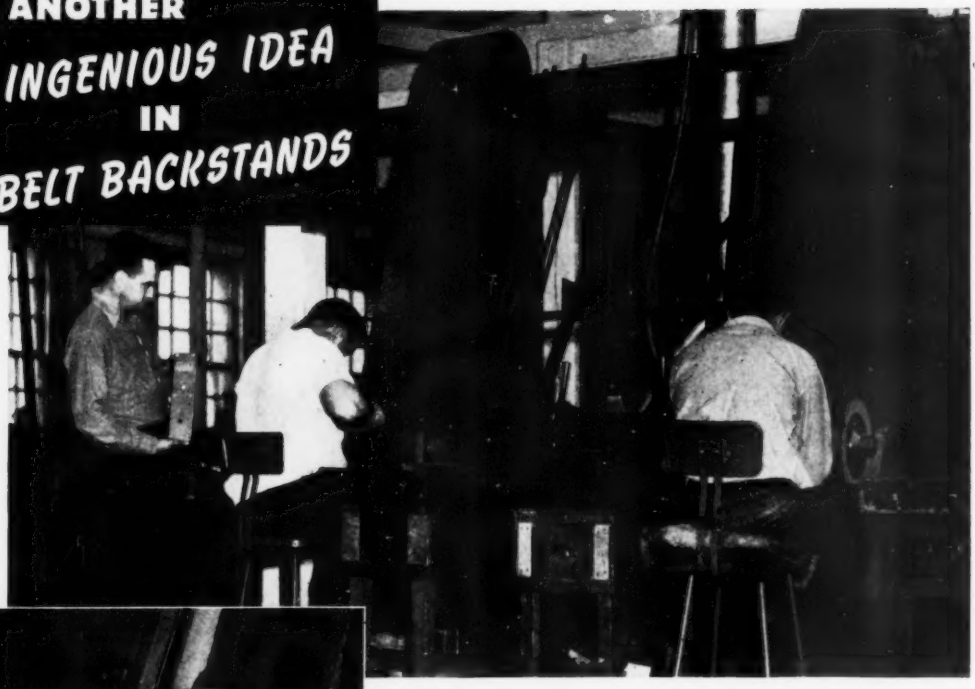
Our bearing specialist near you will show you how to apply them efficiently to your application. And you'll find complete engineering information in Data Book 2550.

LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12.284

ANOTHER INGENIOUS IDEA IN BELT BACKSTANDS



Close-up of finishing on a door-plate, initial and final operations entail simply a quick move from one belt to the other.

Photographs by Coale Pictures, Berlin, Conn.

The profit-saving advantages of finishing with BEHR-MANNING abrasive belts, are doubly realized in this backstand arrangement at P. & F. Corbin, Division of The American Hardware Corp., New Britain, Conn., prominent manufacturers of building hardware. Here are the big points:

1. **A TWO-MOTORED LATHE,** so the operators work independently, and stoppage of one does not stop the other —
2. **TWO CONTACT WHEELS** and belts (rough and finish) at each end of the lathe. Belts are only a few inches apart, making the roughing and finishing almost a single operation on each piece —
3. **BACKSTANDS ARE RAISED ABOVE,** instead of extending back of contact wheels. The supporting structure is mounted on the lathe itself. Valuable floor space is saved.

This ideal arrangement was devised by Mr. Max Grapski, the company engineer, with the cooperation of a BEHR-MANNING Engineer.

ARE YOU HANDLING your finishing operations the most profitable way? Why not utilize the experience of BEHR-MANNING Engineering Service. No obligation. Write to Dept. AM-11.

BEHR-MANNING®
NORTON abrasives

BEHR-MANNING • TROY, N. Y.

COATED ABRASIVES • SHARPENING STONES
PRESSURE-SENSITIVE TAPES
EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N. Y., U. S. A.

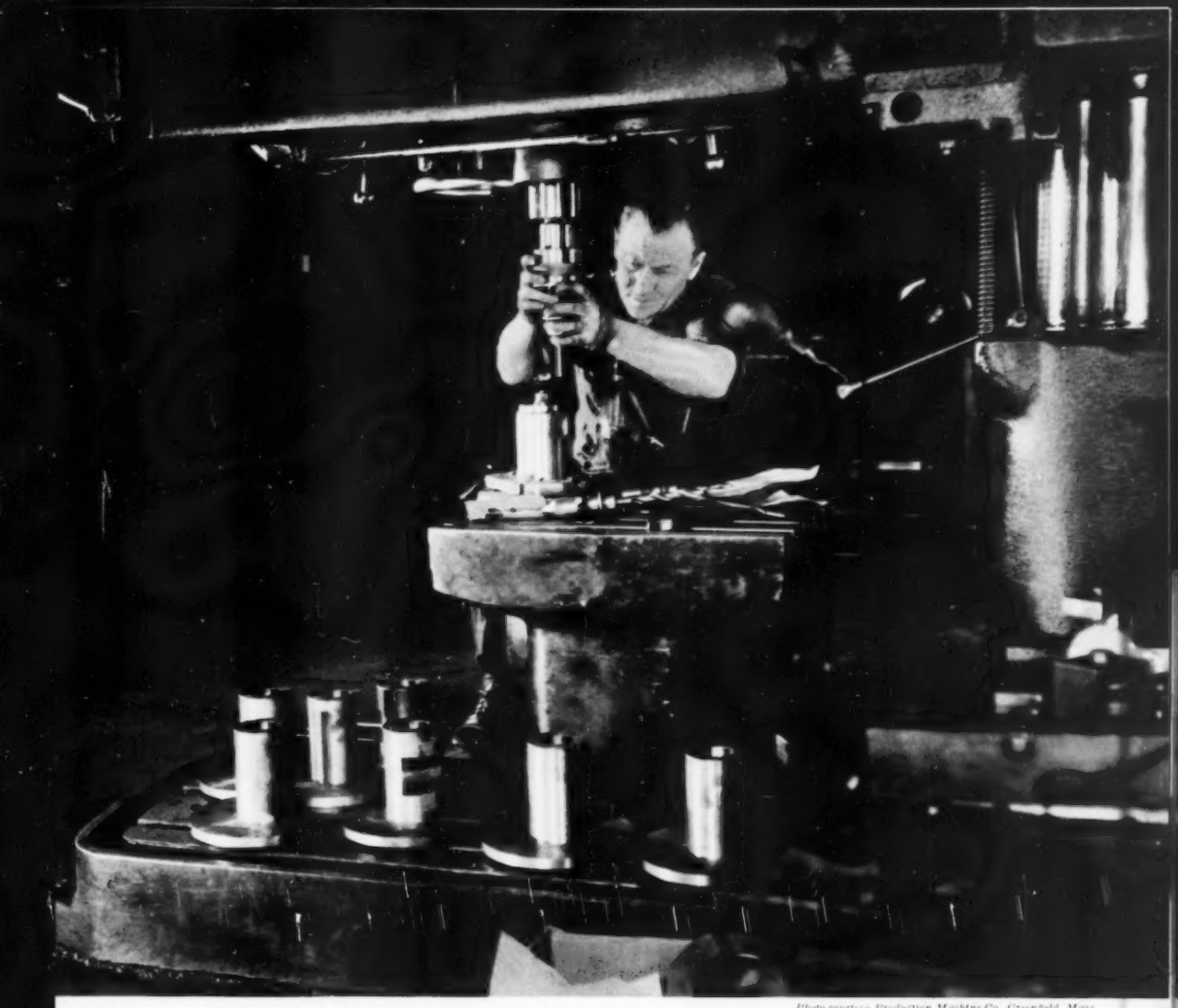


Photo courtesy Production Machine Co., Greenfield, Mass.

Tapping 8 pieces or 8000?

Whether your tapping application is a small-scale job depending on the skill of the operator, or a continuous large-scale operation where down time means troublesome production loss and taps just *have* to be right, you'll like GREENFIELD Taps and GREENFIELD Service.

And, whether you need only a few specially designed taps for a specific job or thousands of identical taps for year-in-year-out operation, you'll also like GREENFIELD Taps and GREENFIELD Service.

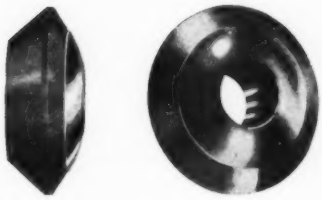
At "Greenfield" no tapping job is too small, and no tapping job is too large. For "Greenfield" Taps call your nearest Distributor.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!

Memo FROM CHIEF ENGINEER
Joe:
This is what Geometric call their "4 Heads in One" type with pull off and out-side trip for both automatics and hand machines.
The new aligning feature should lick the misalignment on those old automatics.
Don
RECESS
64
#8 (.164")
32 NC3
1" X 45°
32
.240"
.238"
1" X 45°
32
7"-20 NF3
16
1"
8
GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT

MACHINING FACILITY IS TANGIBLE

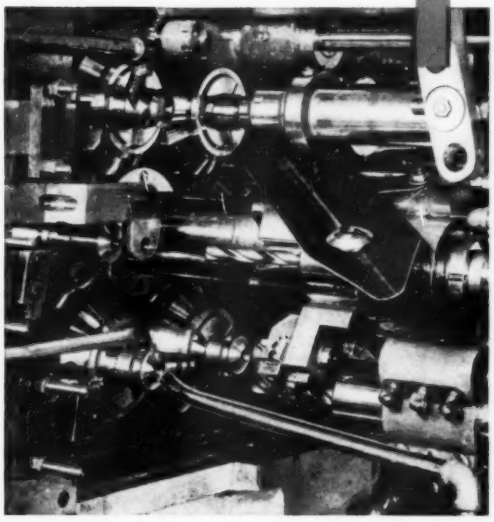


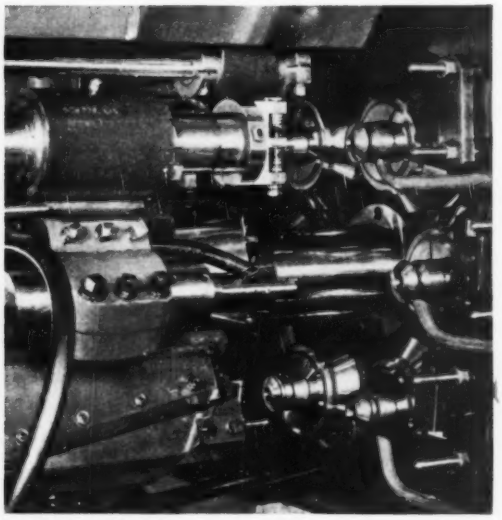
In the production of alloy steel bevel gear blanks on a 2⅝-SIX CONOMATIC, the "all position" endworking attachment facility simplifies the face and hole burnishing operations.

"AUTOMATICS" are good examples of mechanized teamwork. Their main function is to follow through and keep running. But a weak frame, a cramped tooling area, or an inadequate tool support, of one machine alone, can lower the production average of an entire battery.

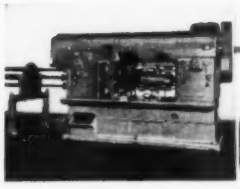
The extra values that pay off in an "automatic" are not just *wished* into the machine; they are *built* there. And only complete information will disclose whether or not they *are* built there. You may have complete information on CONOMATICS.

A Comparison of ALL Automatics is in favor of Cone





FRONT AND REAR SIDES OF TOOLING AREA



Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

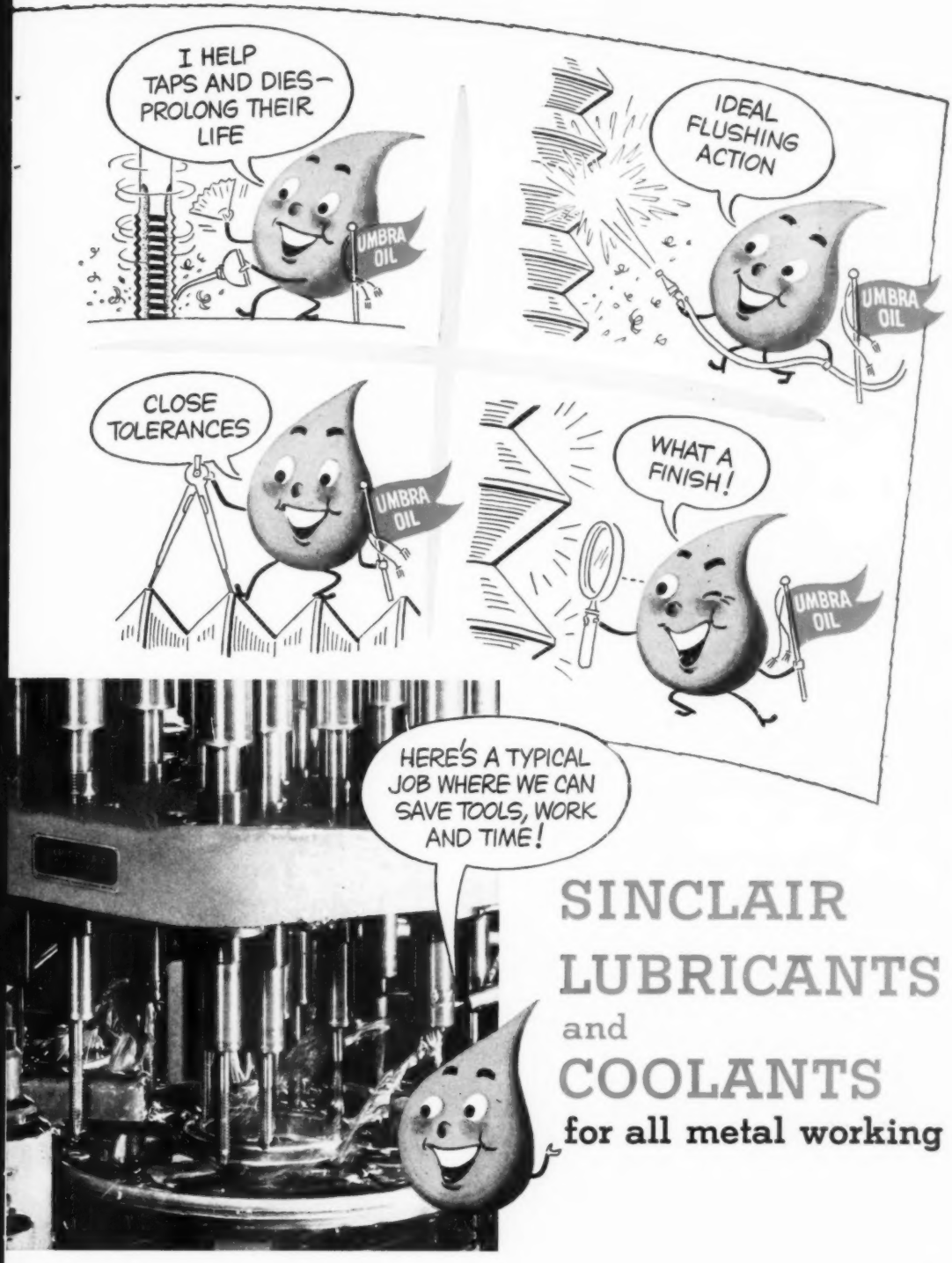
MAKING TOUGH TAPPING and THREADING JOBS EASIER!

By using UMBRA® Cutting Oil you can expect less tool dressing, less operator-time, inspection-time and machine-time per job, less power consumption, and fine finished products.

You profit in many other ways when you use Sinclair UMBRA Cutting Oil in your threading and tapping . . . on all severe jobs . . . on *any* metal. The flushing action of UMBRA will help you get clean, accurate threads and a fine surface finish. UMBRA protects against gumming and corrosion and substantially cuts work and tool spoilage.

Order a trial quantity today and see for yourself. Get in touch with your nearest Sinclair Representative or write direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

Taps of the Threadwell Tap & Die Company in action on a Hartford Special Drilling and Tapping Machine.


I HELP TAPS AND DIES— PROLONG THEIR LIFE
UMBRA OIL
IDEAL FLUSHING ACTION
UMBRA OIL
CLOSE TOLERANCES
UMBRA OIL
WHAT A FINISH!
UMBRA OIL
HERE'S A TYPICAL JOB WHERE WE CAN SAVE TOOLS, WORK AND TIME!

SINCLAIR LUBRICANTS and COOLANTS

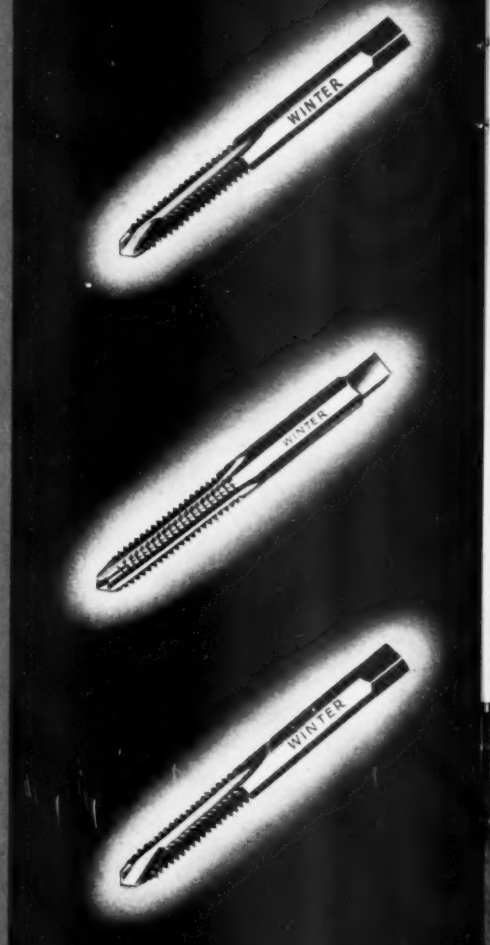
for all metal working

WINTER

BALANCED ACTION

MACHINE SCREW TAPS

SMOOTH, EFFICIENT TAPPING of small diameter holes is assured by Winter Machine Screw Taps. Like all Winter products these small but sturdy taps feature "Balanced Action." Accuracies of diameters, leads, thread forms, chamfers, flute spacings, and flute contours are held to extremely close limits. All Winter "Balanced Action" taps, including chip driver, hand, pipe, nut, tapper, and pulley taps, are stocked by distributors near you, and at factory branches in New York, Detroit, Chicago, and San Francisco. WINTER BROTHERS COMPANY, Division of the National Twist Drill and Tool Company, Rochester, Michigan, U.S.A.



ALWAYS AT YOUR SERVICE

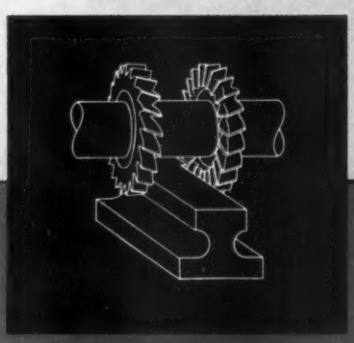
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

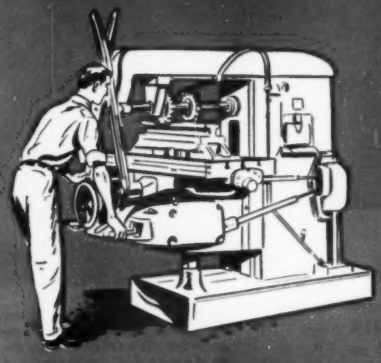
NATIONAL SHEARING ACTION MILLING CUTTERS

TROUBLE-FREE OPERATION, with reduced chatter, under difficult conditions is an inbuilt feature of National "Shearing Action" Milling Cutters. In addition, National "Shearing Action" Milling Cutters give unusually long wear, with top production and performance.

Complete stocks of National cutting tools—twist drills, reamers, end mills, hobs, counterbores, milling cutters, and special tools—are maintained at factory branches in New York, Detroit, Cleveland, Chicago, and San Francisco.

NATIONAL TWIST DRILL AND TOOL COMPANY, Rochester, Michigan, U.S.A.





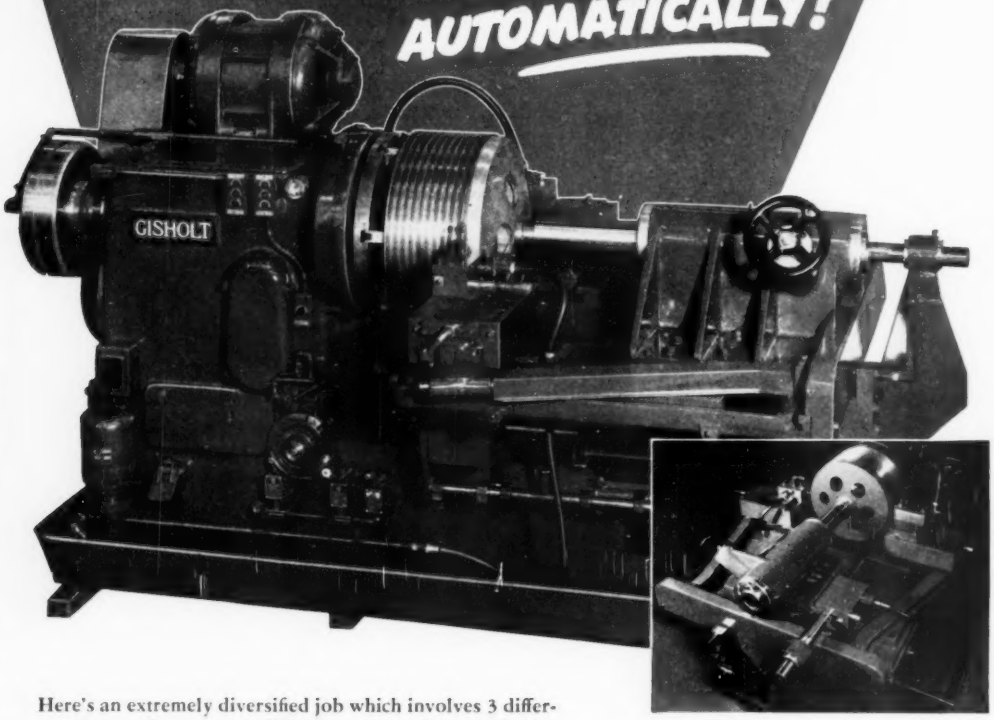
"CALL YOUR DISTRIBUTOR"

It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs —including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

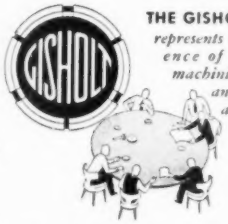
How the SIMPLIMATIC machines 212 different multiple V-belt sheaves AUTOMATICALLY!



Automatic pawl fitting into notched bar sets groove position. A single tool bit on the front slide roughs, while the tool bit on the rear slide finish forms. At end of cut, table is automatically repositioned for next groove. Spindle stops and table retracts automatically at end of job.

Here's an extremely diversified job which involves 3 different sheave diameters, 3 different groove sizes—and with from 3 to 10 grooves on each sheave . . . a total of 212 different combinations! Yet the entire job is simplified to *one* machine—the Gisholt SIMPLIMATIC. The SIMPLIMATIC handles them all automatically—with various pick-off gears and face clamps. The grooves are machined progressively one at a time to avoid excessive heat and strains in the workpiece. Total machining time ranges from 2.7 minutes for the smallest to 11.5 minutes for the largest.

It's one more example of the amazing versatility of this automatic machine. Investigate the SIMPLIMATIC before you invest in a special machine.



THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

A-H5... air-hardening and easy to machine

Toolmakers rely on air-hardening tool steels to reduce the chances of cracking tools and dies during hardening. These steels are also preferred when only the minimum amount of distortion in heat-treatment can be tolerated. Air-hardening steels are deep-hardening, and have the high percentage of carbides that is so necessary for long wear.

From the toolmaker's standpoint, the principal objection to some air-hardening grades is their poorer machinability as compared with low-alloy tool steels. And that's why A-H5 is such a popular steel. It offers all the desirable properties of air-hardening steels, yet it can be annealed to 212 Brinell or less. It's a mighty easy steel to machine, especially when its all-around performance is considered.

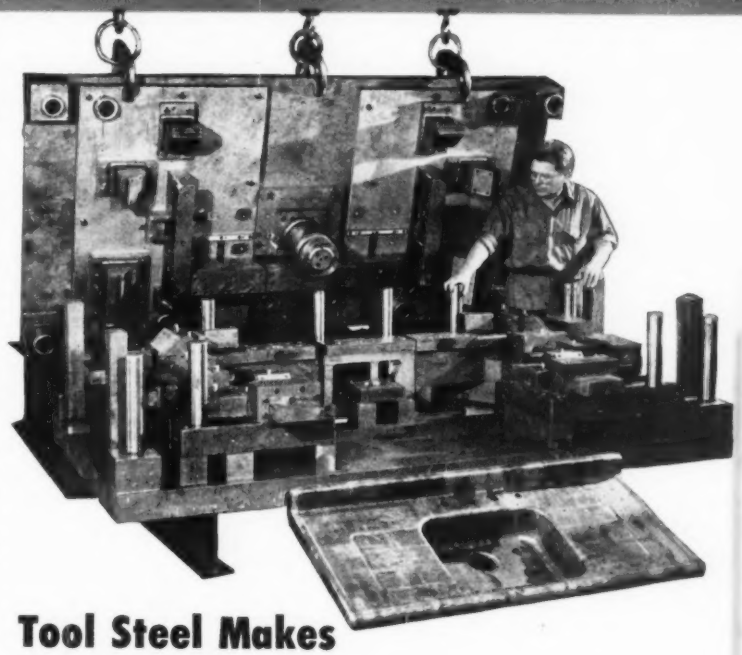
A-H5 is a general-purpose steel, suitable for nearly all tool and die jobs. Requiring a less drastic quench than standard oil-hardening grades, it also has greater wear-resistance, reduced distortion in heat-treatment, good shock properties. And its cost is on a par with the general-purpose, oil-hardening grades.

A-H5 is a steel worth looking into if you're looking for a safe, long-wearing tool-and-die grade that doesn't have to be pampered when it comes to machining and heat-treating.

Typical analysis:

C	Mn	Cr	Mo	V
1.00	0.60	5.25	1.00	0.25

Machining air-hardening tool steel causes no headaches in this shop because they're using A-H5. This user reports long wear and minimum distortion on a wide range of trimming and blanking dies.



Tool Steel Makes Kitchen Sinks, Too

Here's a man-sized die designed and built by A. F. & G. Tool & Die Co., Inc., Baltimore. Having wearing parts entirely of our BTR tool steel, this die is used to trim and pierce five different sizes of 14-gage steel kitchen sinks, one of which is shown in the foreground. Hardened to Rockwell C-56 to 58, this mammoth die will see service in a 250-ton press.

BTR, you know, is our general-purpose type of oil-hardening steel. It wears a long, long time and distorts very little in heat-treatment. Best of all, it's an economical steel that's easy to machine, easy to heat-treat.

Our Tool Steel Engineer Says:

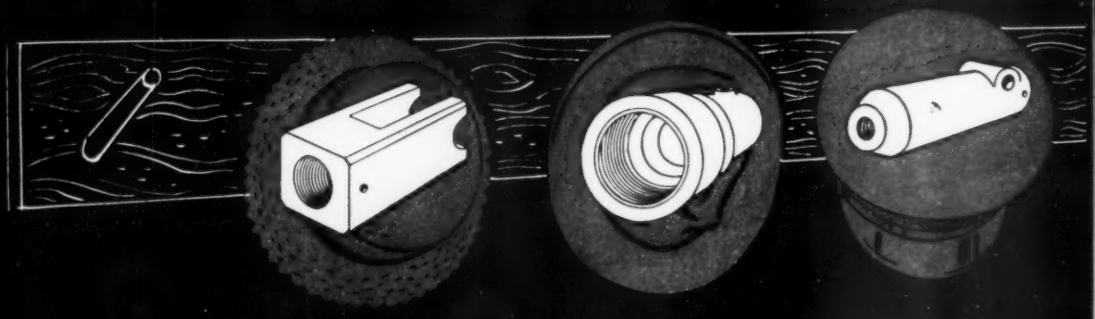
Remove the entire surface of tool steel bars

It's important to remove the outside surface of tool-steel bars, even though portions of this surface do not serve as a working surface of the tool or die. Higher hardening stresses are set up in heat-treating a tool that has any decarburized surface.

Equal amounts of stock should be removed from *all* sides of a bar. This avoids warpage of the tool during heat-treatment. Sometimes a toolmaker will merely "skin" one surface of a flat bar and then, in order to arrive at the required thickness, remove all the remaining steel from the other surface. This is bad practice, not only because it invites warpage, but also because it is an incomplete removal of decarburization from the skinned side.

Bethlehem ULTRASONIC TESTED **Tool Steel**

a thousand jobs



One of the lathe line-ups at the C. B. Christiansen Machine Shop, Newark, New Jersey. In this shop you'll find 2 Heavy Duty Engine Lathes, 10 Regals, 1 Sliding Bed Gap Lathe and 1 Rapid Production Lathe . . . all LeBlonds! Recent jobs ranged from a 67" diameter ring gear down to "57 varieties" of "watch-charm" work.

for quick-change artists

Run a job shop with a quality reputation and you'll have to depend on your lathes 100% to turn out your work fast, to tolerance, with profit. Those lathes have to be "quick-change artists"! That's why Christiansen operates 14 LeBlonds. With plenty of new jobs to attack each day, they have found LeBlond Lathes smart business investments.

As Don Phillips of LeBlond's New York Office puts it, "It's pretty hard for anyone except LeBlond to have such all-around satisfied customers as Christiansen. That's the advantage of our complete line. No matter what kind of turning Christiansen's business calls for, one of our standard LeBlond Lathes fills the bill exactly.

"LeBlond men never have to recommend an 'almost-right' lathe simply to get the order. That's where our customers' confidence in LeBlond really starts." Experienced lathe buyers know this to be true. From the 13" Regal to the largest Automatic Crankshaft Lathe, LeBlonds are easiest to select, easiest to apply with certainty to a specific job . . . and the surest producers of profitable metal turning. Call in your LeBlond Distributor, or write Cincinnati. Start now. Learn what that "confidence" Don Phillips mentioned can mean to you.

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Catalog A to find the right lathe for your job.

turned faster by **LeBLOND** *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 64 YEARS

SPRINGFIELD LATHES

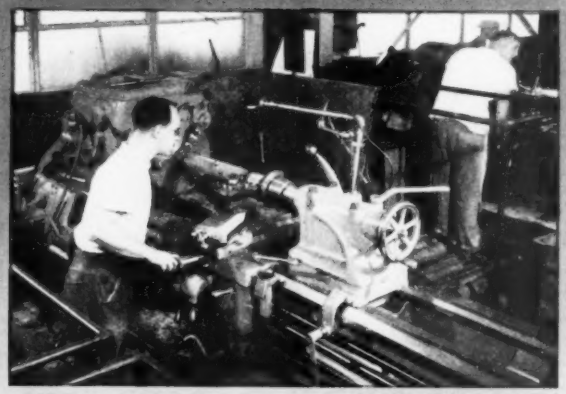
on the PAYLOADER

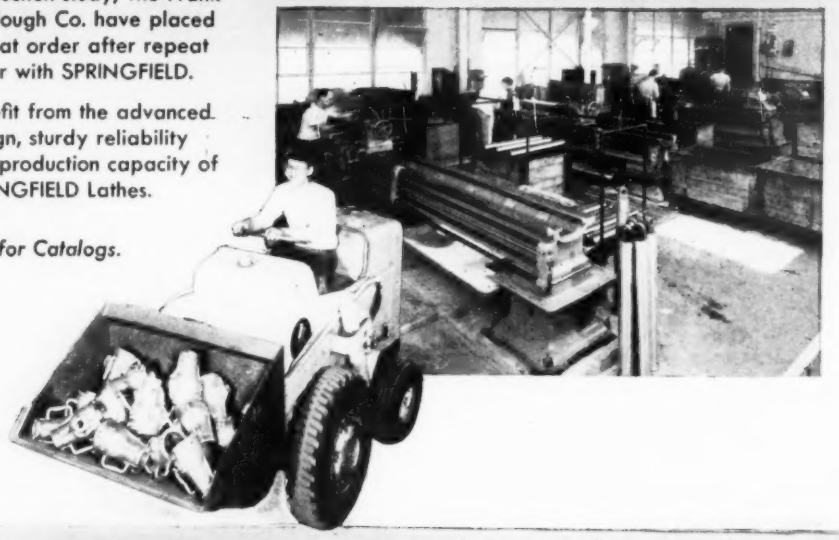
Years of experience in applying engine lathes to the production of various parts for the world-famous **PAYLOADER** have convinced The Frank G. Hough Co., Libertyville, Ill., SPRINGFIELD LATHES are completely satisfactory, extremely versatile and productive.

On the basis of actual records of their installations, operator preference, maintenance cost and production study, The Frank G. Hough Co. have placed repeat order after repeat order with SPRINGFIELD.

Benefit from the advanced design, sturdy reliability and production capacity of SPRINGFIELD Lathes.

Ask for Catalogs.





THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

ACCURACY the EASY WAY...

with the

Van Keuren »»» GEAR MEASURING SYSTEM

Spurs, Helicals, Splines, Serrations

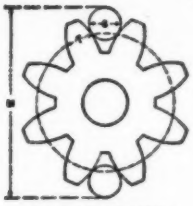
Set No. 26 EX. External Gear Measuring Wires. $155.00

THE Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

The only equipment required is a set of 2 wires of the proper size for each diametral pitch.

Standard sizes of wires available from stock are:—

1.728" / DP	for external spurs and helicals.
1.44" / DP	for internal spurs and splines.
1.92" / DP	for enlarged pinions, 30° involute splines and 90° involute serrations.
1.68" / DP	Alternate series for special requirements.

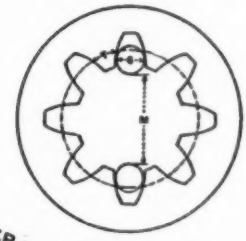


EXTERNAL SPUR GEAR

SIMPLE . . . For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE . . . The 1.728"/DP System is used by over 93% of American gear producers and users. The 1.44"/DP and 1.92"/DP systems have been incorporated in standards for involute splines and serrations.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.



INTERNAL SPUR GEAR

MEMBER OF AGMA

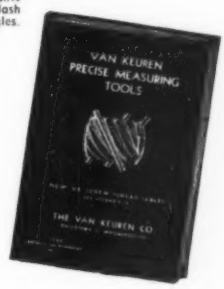
CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

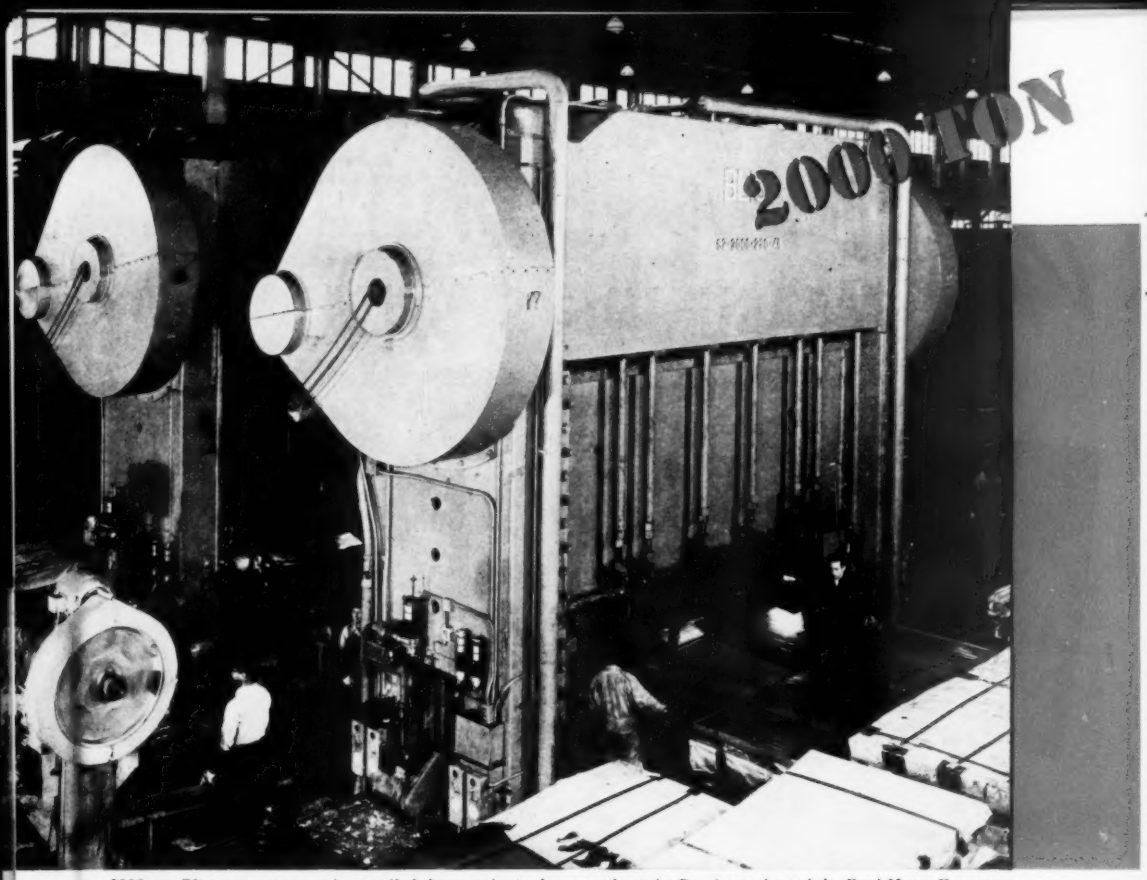
Copies now free upon request.



THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



2000-ton Bliss presses, recently installed, form and trim heavy rails at the Dearborn plant of the Ford Motor Company.

New Bliss Heavy-Tonnage Presses Join Ford Production Lines

Ford production lines' ever-increasing efficiency and reliability are no accident. They embody intensive studies of advanced equipment and techniques—especially in heavy-tonnage forming where improvement gives substantial savings. A case in point is the *new rail press line*—five Bliss 2000-ton presses recently installed by Ford.

Unusual design features provide capacity to spare and protection against downtime even with steady 'round-the-clock operation:

- Extra-deep crown, bed and slide members minimize deflection
- Crankshaft construction withstands most severely unbalanced loads
- Crankshaft jointed at center; simplifies maintenance, cuts down on floor area needed
- Twin pinions and intermediate gears distribute load on intermediate shafts
- Oversize crankshaft, clutch and brake reduce possibility of downtime

These design highlights show how Bliss' creative press engineering is applied to particular metal forming operations. You can get Bliss started on *your* special press engineering by calling your local Bliss representative. Virtually a production counselor for metal stampings, he is your liaison with Bliss' engineering staff, can recommend equipment and methods ...advise you on production rates and costs.

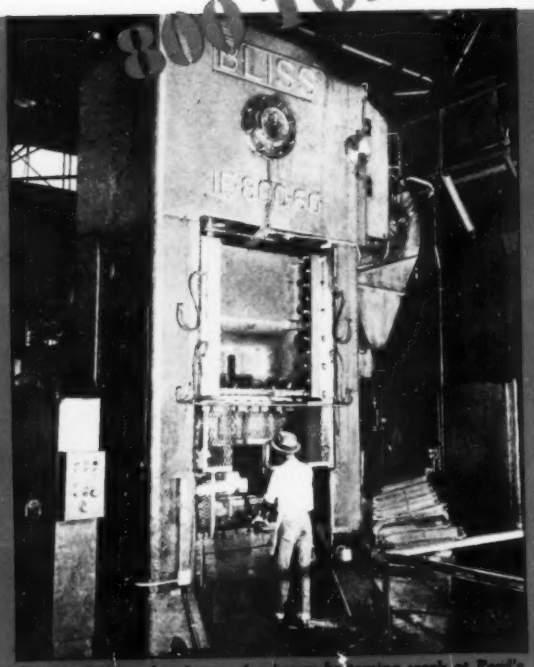
E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

Presses, Rolling Mills, Special Machinery

800 TON



800-ton Bliss enclosed press for heavy bottoming work at Ford's Mound Road plant, Detroit.

750 TON

750-ton Bliss double-action press for high-speed drawing at Ford's Dearborn plant.

500 TON

500-ton universal four-point presses for body stamping at Ford's Dearborn stamping plant.

700-PAGE HANDBOOK TELLS HOW TO USE PRESSES EFFICIENTLY

Bliss Power Press Handbook, 436 Illustrations. Sections on: Easy methods of computing press jobs • How to select proper press • Engineering tables • Die illustrations • Glossary of terms. Plus service section on all Bliss presses. Price $7.50

E. W. Bliss Company—Handbook Dept., Canton, O.

For Heavy-Tonnage Presses—

Mechanical or Hydraulic...

It's Bliss

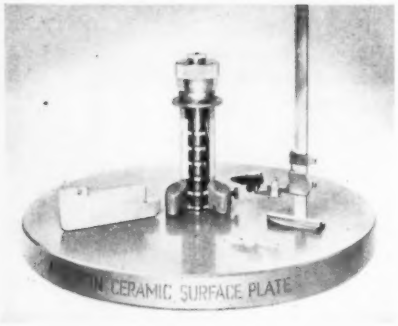
NORTON
Ceramic
Surface Plates
They're Flat!
and stay flat!
They're S-m-o-o-t-h!
They're Wear-Resistant!
Won't Corrode!
They're Easily Cleaned!
Non-Magnetic!

Better Buy Norton
Ceramic Surface Plates

We've no doubt you will find a ***"carnival"*** spirit in plants pleased with the performance of Norton Ceramic Surface Plates.

These ceramic surface plates are ***"headliners"*** in their own right. You can shout about them with enthusiasm. And you know that you're not cheating anybody — for these ceramic surface plates are certainly worth every penny that they cost — and more!

As a matter of fact, in plant after plant, Norton Ceramic Surface Plates are paying for themselves by their extra-long, trouble-free service. The reason? Because they are made of one of the hardest substances known. This gives them a wear-resistance which shows off to best advantage on your severest production gaging and blueing operations.



Another feature attraction of Norton Ceramic Surface Plates is the new precision standard of continuously smooth finish given to their surface. This permits easy movement of instruments and work across the plate without excessive drag and without vibration. This precision flatness prevents wear of expensive instrument bases, gage blocks and sine bars.

All your inspectors will shout about the easy-to-use Norton Ceramic Surface Plates that neither sweat nor corrode — that never require greasing or protection from moisture — that cannot warp or deform, or give expansion troubles, or deflect under load because they're made of a durable and stable material.

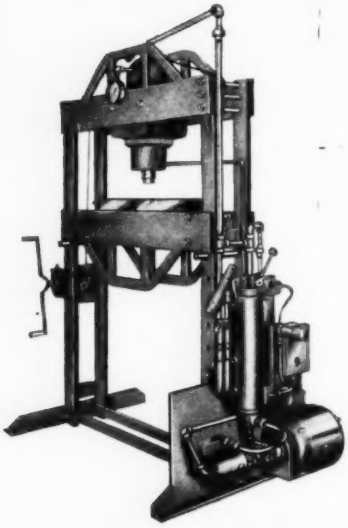
Hurry! Hurry! Hurry!
If you're in a hurry for these best of all surface plates, order today from your nearest Norton distributor or write directly to us. Norton ceramic surface plates are available from stock in diameters from 5" to 24".

NORTON

NORTON COMPANY, WORCESTER 6, MASS.
DISTRIBUTORS IN ALL PRINCIPAL CITIES
DISTRICT SALES OFFICES: New York 6 Philadelphia 44 Pittsburgh 23 Cleveland 3 Detroit 8 Chicago 32

Biggest Name in Vacuum Bottles

USES K·R·WILSON PRESS



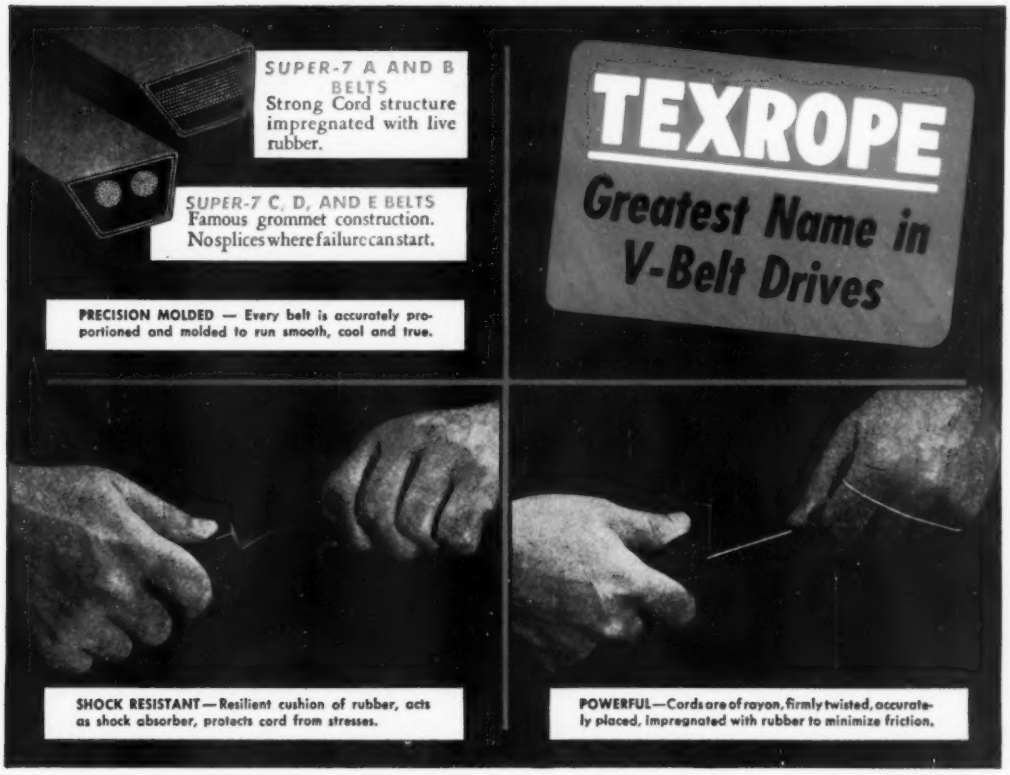
No doubt about it! The "Thermos" bottle is as familiar to the American scene as the illustrious hot dog. And our good customer, American Thermos Bottle Co., uses a K. R. Wilson Hydraulic Press in producing thousands of these famous "hot coffee containers" every year.

Tool boxes, skis, gas tanks, glove compartments in cars, even milady's cold cream . . . these and hundreds of other products are processed somewhere along the line on KRW presses. If there's a place in *your* manufacturing operations for Hydraulic Presses, you'll save money and cut production costs with KRW. Available in 25 - 150 ton capacities, K. R. Wilson presses are self contained completely above ground. In many cases, the cost of a KRW press has been less than the foundation cost of heavier mechanical equipment recommended for the same job. One, two and three cylinder models; either hand-operated, air-operated or motor driven; vertical or horizontal ram travel. If you need a specially built press to do a special job, let us know. We'll engineer one to your specifications.

K·R·WILSON

215 Main Street - Buffalo 3, N. Y.

• Ask your machinery dealer to quote you . . . or write or wire Dept. 11 for full facts and prices.


SUPER-7 A AND B BELTS
Strong Cord structure impregnated with live rubber.
SUPER-7 C, D, AND E BELTS
Famous grommet construction. No splices where failure can start.
PRECISION MOLDED — Every belt is accurately proportioned and molded to run smooth, cool and true.
TEXROPE
Greatest Name in V-Belt Drives
SHOCK RESISTANT — Resilient cushion of rubber, acts as shock absorber, protects cord from stresses.
POWERFUL — Cords are of rayon, firmly twisted, accurately placed, impregnated with rubber to minimize friction.

Cool Running... LONG LIVED!

SUPER-7 V-belts give long, satisfactory service even under bad conditions of load, shock and grit.

Tough, double-wrapped cover bias cut for elasticity and impregnated with rubber. Effectively seals out dust, grit, moisture; takes the wear; keeps the belt in shape; and protects cord structure.

But you get more than good belts when you standardize on *Super-7* V-belts. You also get the benefit of the greatest V-belt experience in the world both in the field and factory. You are assured of exactly the right drive for longest life from the wide variety of types and sizes available.

High Capacity Belts

Where space is limited or other special conditions demand heavier duty, the high capacity belt can be furnished in A, B, C, D, and E sections . . . Extra strong cords, special rubber cushion and tough Neoprene cover give them 40% greater capacity than standard belts at proportionately higher price.

V-Belt Drive Headquarters

Your nearby Allis-Chalmers Authorized Dealer or Sales Office can serve all your V-belt needs, whether they be new or replacement V-belts; standard and variable speed sheaves; or speed changers.

Get your copy of the revised 120 page *Texrope* Pre-Engineered Drive Manual from your A-C Dealer or Sales Office or write for Booklet 20B6956A. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3291

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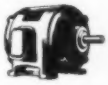


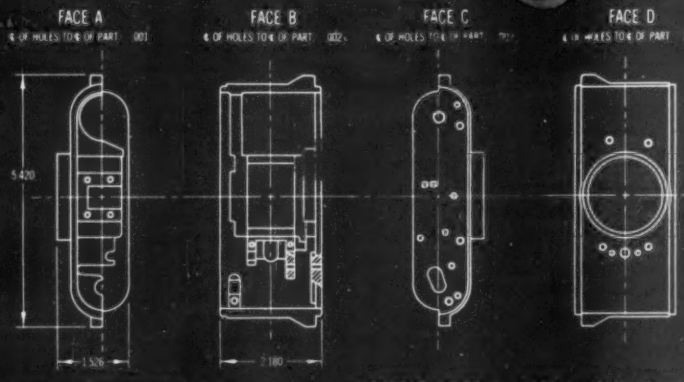
MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

Snapshot of a Profitable Operation



PART: Plastic Camera Case

PRODUCTION: 250 parts per hour for the battery of NATCO A-33 Light Sensitive Multi-Drillers

OPERATIONS:

FACE A—Drill four holes to .070" diameter

FACE B—Drill two holes to .067" diameter and one hole to .0781" diameter

FACE C—Drill six holes to .0781" diameter, three holes to .089" diameter, one hole to .120" diameter, one hole to .082" diameter and one hole to .281" diameter

FACE D—Drill two holes to .070" diameter, two holes to .1465" diameter, two holes to .0781" diameter and one hole to .191" diameter

Battery of Natco A-33 Light-Sensitive Multi-Drillers

NOW...250 of these camera parts per hour are drilled on four faces with extreme accuracy...size of holes from .067" to .281"

When maintenance became too costly a camera manufacturer substituted this battery of NATCO A-33 Light Sensitive Multi-Drillers. An indication of the precision and production of these new NATCO's is evidenced in the following quotation from the camera manufacturer: "Despite the high degree of accuracy which is maintained, the production rate from the battery of NATCO's is approximately 250 units per hour." In terms of profitable operation this NATCO installation represents a big improvement for the manufacturer and is helping him to keep maintenance and production costs in line and product quality high. Let NATCO help you meet rising costs . . .

Call a Natco Field Engineer

to help you solve your problems in Drilling, Tapping, Boring & Facing

Golden Anniversary

1901 NATCO 1951

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

This man...

SOLVES YOUR INVENTORY PROBLEM!

Inventory often is too little and too late or too much and too soon. It ties up money needed for operating expenses or it ties up the plant by lacking things it should supply.

There is a man in your locality who will finance your inventory. He has at all times approximately $500,000,000 invested in the tools, equipment and materials you need. He will gladly and promptly supply from his large local stocks many things which you frequently and urgently need. Why not get better acquainted with this man.

Creditable

"This man" is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

There are approximately 2,000 Industrial Distributors serving every industrial section of the United States. In 1948 their total sales were more than $3,000,000,000. They carry an average inventory of $500,000,000, turn their stocks 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.

Bunting®

BRONZE BEARINGS
BUSHINGS
PRECISION BRONZE BARS

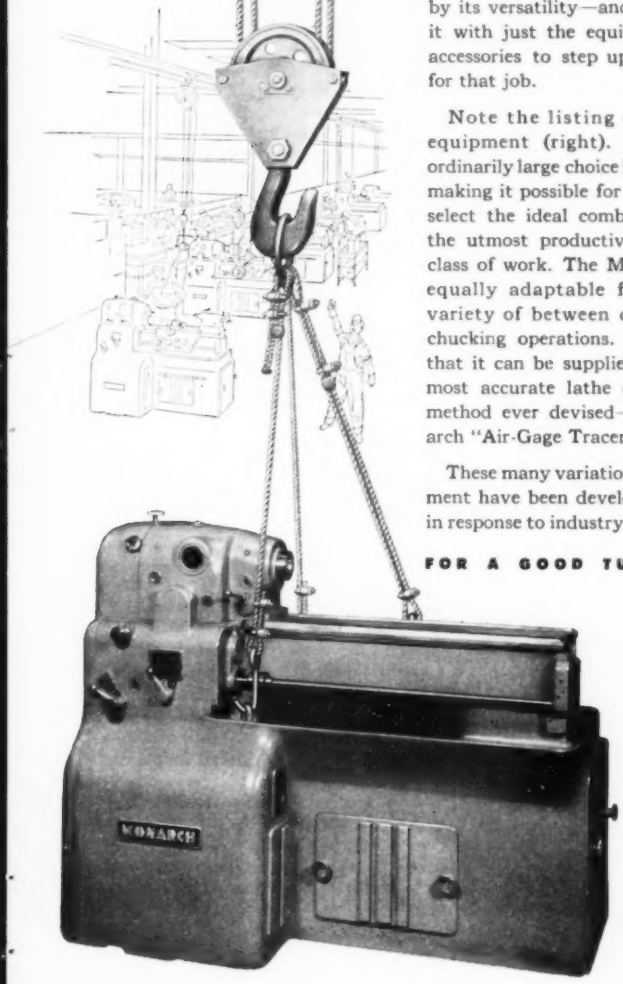
THE BUNTING BRASS & BRONZE CO., TOLEDO 9, OHIO

Here's Where *You* Come In!

That's right—from here on you can just about write your own ticket! Think of the most exacting assignment for small lathes anywhere along your production lines. Then tell us about it. We'll deliver a high-speed, sensitive Monarch 10″ Model EE—a lathe with an inbuilt productivity matched only by its versatility—and you'll get it with just the equipment and accessories to step up standards for that job.

Note the listing of typical equipment (right). An extraordinarily large choice is available, making it possible for the user to select the ideal combination for the utmost productivity on *his* class of work. The Model EE is equally adaptable for a wide variety of between center and chucking operations. Note, too, that it can be supplied with the most accurate lathe duplicating method ever devised—the Monarch "Air-Gage Tracer."

These many variations in equipment have been developed solely in response to industry's demands that we make the basic Model EE design available for constantly widening uses. Could anything we say speak better for its design and specifications? Some place—*many* places, perhaps—this outstanding Monarch lathe can improve your production at lower cost. Send the coupon today for full details . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



TYPICAL EQUIPMENT

- "Air-Gage Tracer"
- Steady rest
- Follow rest
- Taper turning attachment
- Collet attachments
- Air equipment
- Bar feed attachments
- Collet chucks
- Jaw chucks
- Step chucks
- Stops
- Micro-gaging diameter dial
- Hexagon power feed bed turret
- Hand operated cut-off slide
- Variable feed control
- Ball turning rest

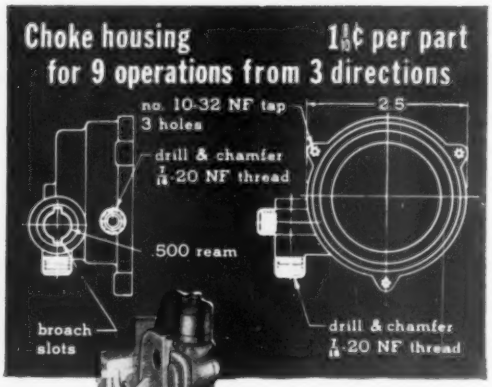
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

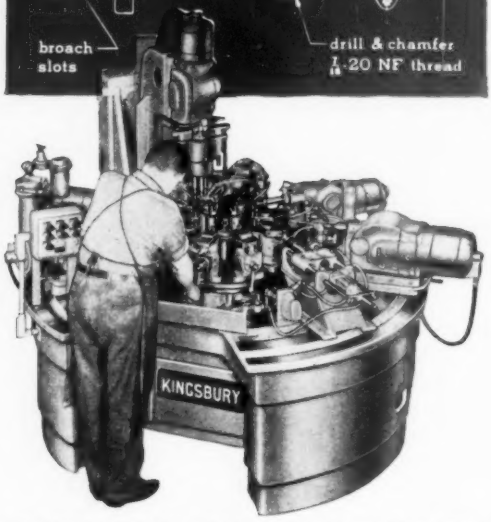
THE MONARCH MACHINE TOOL CO., Sidney, Ohio

Gentlemen:
Please send me without obligation your Booklet No. 1003 covering the Monarch Precision Manufacturing Lathe—Model EE. *(It's that new one with 28 pages and a host of those sparkling Monarch illustrations.)*

NAME_____
COMPANY_____ TITLE_____
ADDRESS_____
CITY_____ ZONE____ STATE_____



155 PARTS AN HOUR GROSS. This non-index machine has one fixture in the center that holds the shaft with its axis vertical. Four horizontal and two angular units drill all nine holes at the same time. Clamping and unclamping are automatic.



305 PARTS AN HOUR GROSS. On this 20-inch "Auto Index" horizontal units work on two faces. Two units are 45° left of radial lines through the fixtures; three units and an air cylinder for the broach are 45° right. A vertical unit taps three holes.

One Kingsbury replaces

Special-purpose high-production machines use automatic units to perform thousands of operations per man-hour

Dear Sir:

How many operations do these four Kingsburys do in an hour? If you multiply the number of operations per part by the production at 80% efficiency you get —

Shaft	1116
Choke Housing	2196
Transmission part	5856
Throttle Body	4800

Compare the number of operations that standard machines do in an hour with these Kingsbury figures. That gives you an idea how many standard machines one Kingsbury can replace.

Several machines in one

Each machine has several automatic drilling and tapping units (½ to 5 hp) that operate at the same time. Each unit does the operations that one standard machine would do.

On the machine for the Shaft all units operate on the same part at the same time. The other three machines have index tables with a number of duplicate work fixtures. The units operate at different stations. The table indexes to present each part in turn to each station.

All this in 7.4 seconds

For example, the Throttle Body machine does all this in 7.4 seconds:

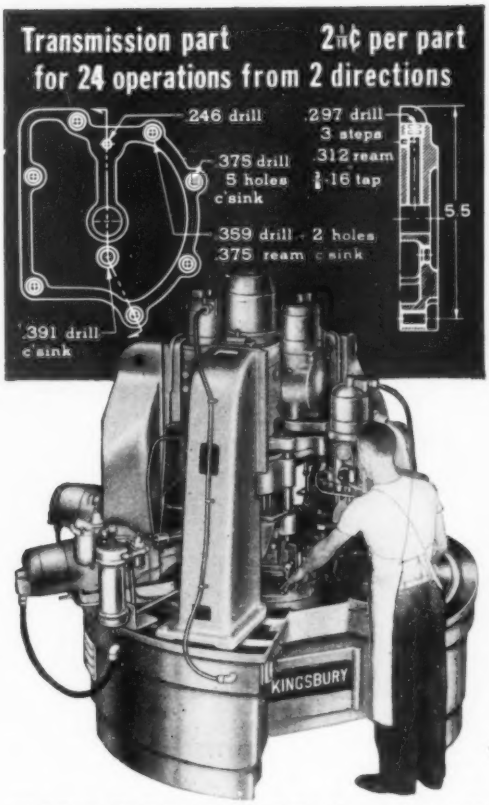
In front the part is unclamped. The man removes it and replaces it with another part. (The right view is the plan view in the fixture.)

At station 1 on his left a milling unit mills the face of another part.

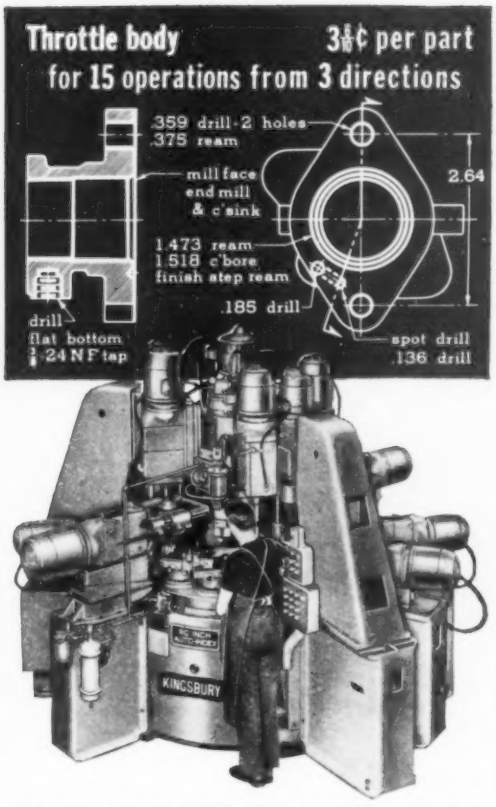
At station 2 a vertical unit counterbores another part 1.518.

At station 3 a horizontal unit drills for the tapped hole. A 4-spindle vertical unit drills three holes at station 3 and spot drills at station 4 because the center distances are so close.

At station 6 in the rear an angular unit drills the .136 hole.



305 PARTS AN HOUR GROSS. A 20-inch power index table has eight fixtures. Three horizontal units drill .297 in steps for a short time cycle. Two others ream and tap. Four vertical units with multi-spindle heads do the nine holes in the left view.



400 PARTS AN HOUR GROSS. Here is a 60-inch automatic indexing machine, the largest size we build (and ever hope to). It has one angular and four horizontal units on knees that are bolted to the base and six vertical units on the central column.

many standard machines

At station 7 a vertical unit reams the throttle bore 1.473.

At station 9 a vertical unit finish step reams the throttle bore and a horizontal unit flats the bottom of the tapped hole.

At station 10 a 2-spindle vertical unit reams two holes .375 and a horizontal unit taps ⅜-24.

At station 11 on his right a vertical unit with a combination tool end mills the face to remove tool marks and countersinks the throttle bore.

All that takes 7.4 seconds. Indexing takes 1.6 seconds. So the total time cycle is (theoretically) 9.0 seconds. That means a gross production of 400 parts an hour (3600 secs ÷ 9 secs.).

This machine has no units at stations 5 and 8, so our customer can add operations if the product should change. On any Kingsburys you can relocate units and change speeds and feeds. Compared to general purpose machines they are not too flexible.

But their output is just terrific.

Sincerely,
Kingsbury Machine Tool Corp.
96 Laurel Street, Keene, N. H.

Each unit cost on the drawings includes the cost of the man and of the machine - no power or overhead. We assumed:

Unit cost of the man equal to:

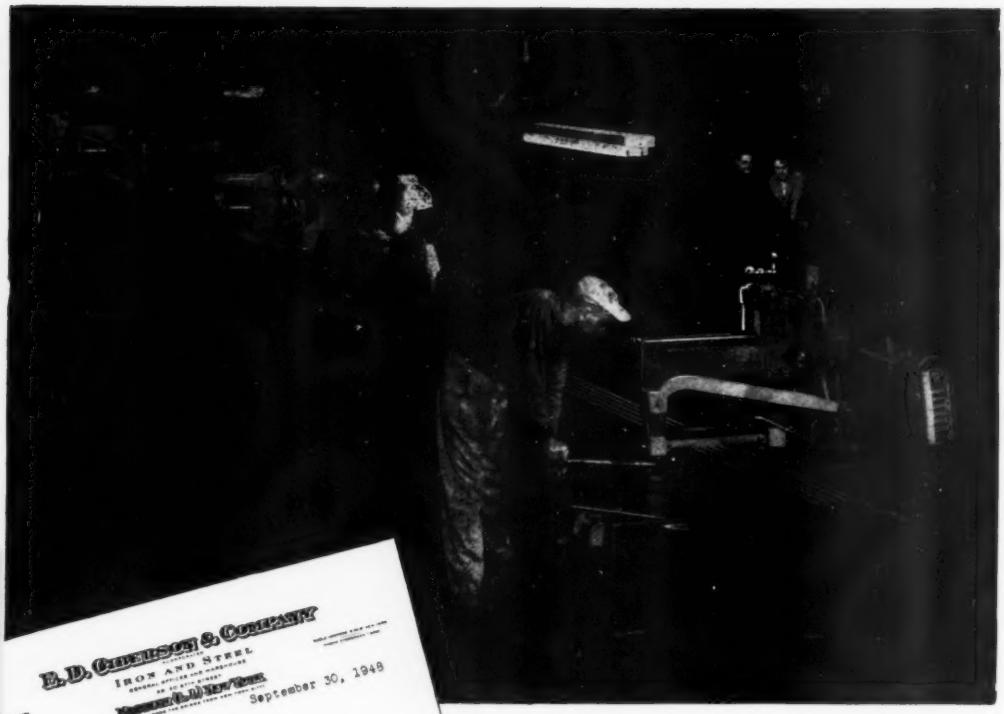
$$\frac{\text{average U.S. hourly wage}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

Unit cost of the machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% eff.}}$$

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production



E. D. GIBERSON & COMPANY
IRON AND STEEL

September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a century as direct distributors of Boiler Tubes, Condenser Tubes in seamless steel, electric welded steel and stainless steel, as well as seamless and welded Mechanical Steel Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have cut in our warehouse many million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,

E. D. GIBERSON & COMPANY, INC.

E. D. Giberson

President

Another Tubing Warehouse "Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growing list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths."

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

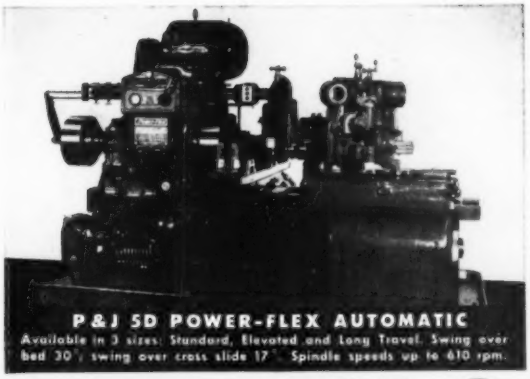
Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations."

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. COMPANY

5700 WEST BLOOMINGDALE AVENUE "The Hack Saw People" CHICAGO 30, ILLINOIS

One SET OF COMBINATION TOOLING ON THE P&J 5D AUTOMATIC DOES IT FOR ALL 4 JOBS

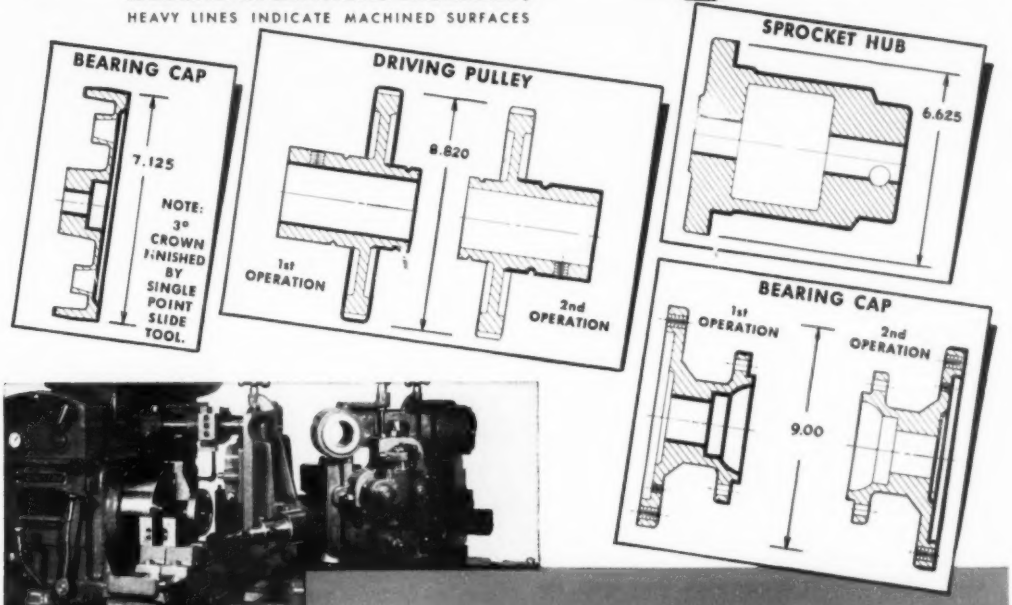


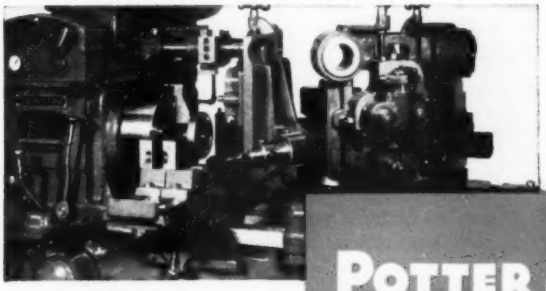
P&J 5D POWER-FLEX AUTOMATIC

Available in 3 sizes: Standard, Elevated and Long Travel. Swing over bed 30"; swing over cross slide 17". Spindle speeds up to 610 rpm.

(SECOND OPERATIONS INCLUDED)

HEAVY LINES INDICATE MACHINED SURFACES





Numerous similar examples of productivity with P&J Tooling on P&J AUTOMATICS are illustrated in this free Booklet. Write for your copy.

POTTER & JOHNSTON Co.

Subsidiary of PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
PAWTUCKET, RHODE ISLAND, U. S. A.

Precision Production Tooling for 53 years

P&J

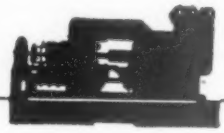
PROFIT BY OUR READY-MADE EXPERIENCE

There's nothing new to us about these munitions parts—or a hundred others in the same class.

In World War II, Acme-Gridley Multiple Spindle Automatics in Government arsenals, and in industry defense plants, turned out untold millions of these parts to Army, Navy and Aircraft specifications. The round-the-clock production line performance of these automatics is too recent to be forgotten.

Out of this vast experience we've again been alerted to set up even higher production standards for many kinds of Government defense work. Once again, the Acme-Gridley's constantly improved advantages for tooling, tolerances and faster production times are ready to meet these requirements.

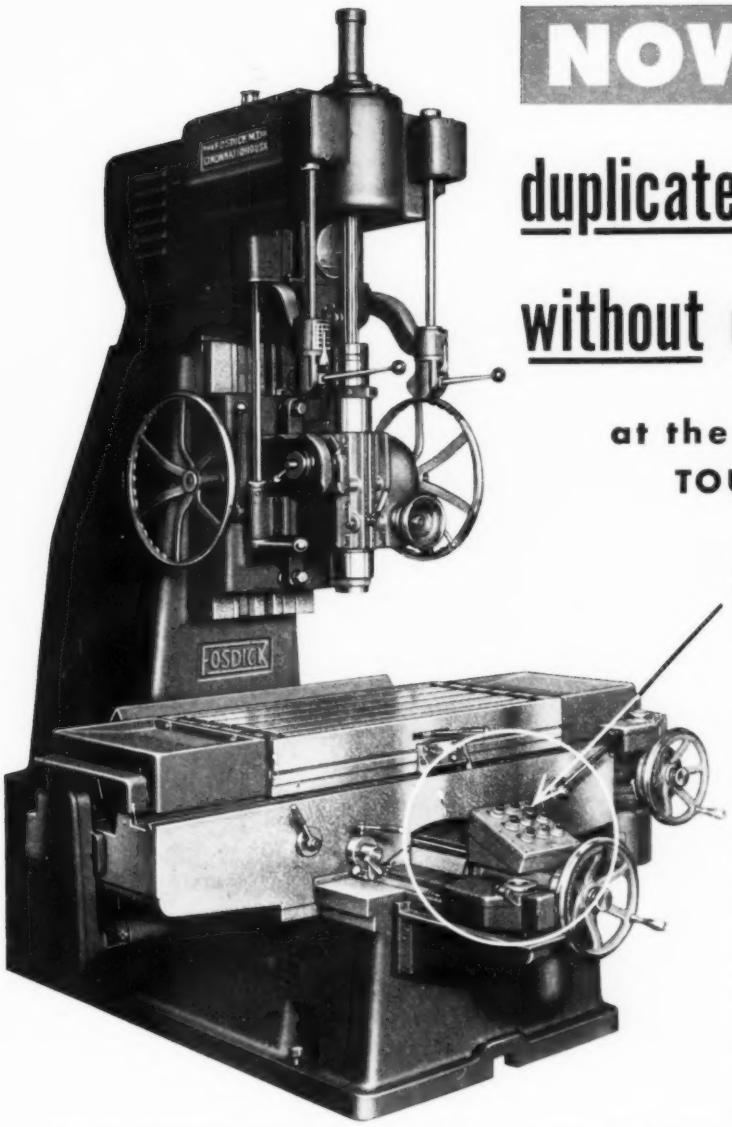
Before you swing into action with your Acme-Gridleys, profit by our ready-made experiences. Save the cost of experimentation and the loss of precious time. Acme-Gridley standardized procedures and tooling can by-pass these losses for you. Just tell our engineering experts how they can help you—they'll do the rest.



THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

No other source offers a line so COMPLETE—so much design and tooling EXPERIENCE in Multiple and Single Spindle Bar and Chucking Automatics.



NOW...

duplicate parts without costly jigs

at the TOUCH of a BUTTON

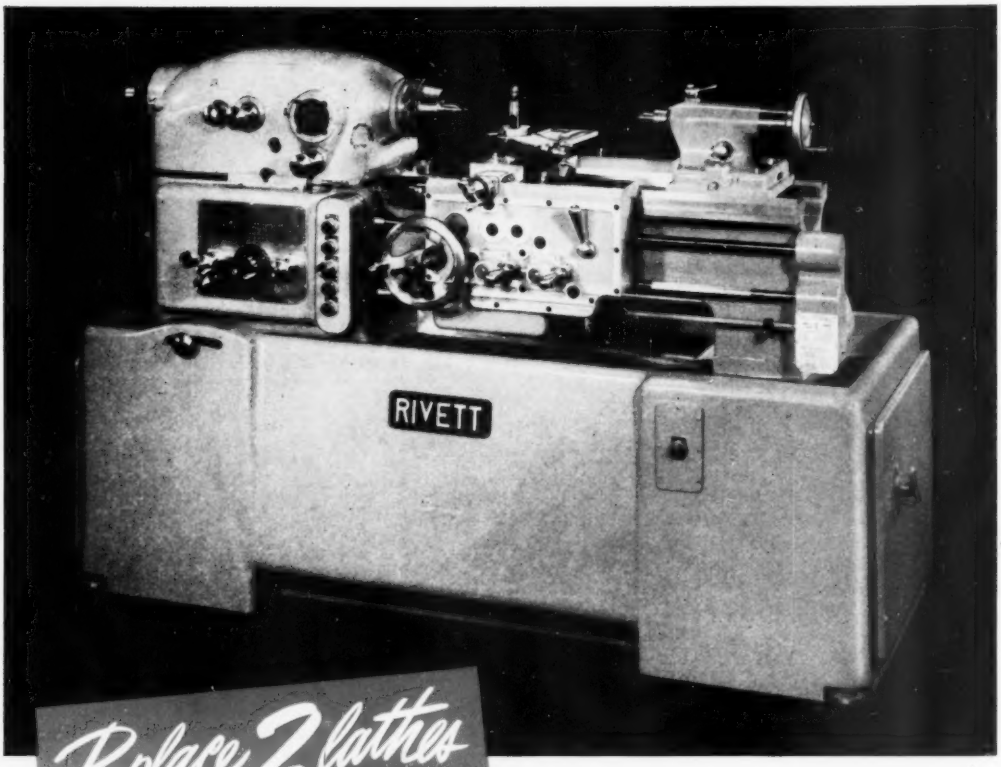
For exact reproduction of drilled, bored and tapped parts — *weeks*, *months* or *years* apart — install a Fosdick Automatic Positioning Machine. This new machine tool eliminates costly jigs, makes possible accurate part duplication with holes located to tolerances as close as ±.0001", by means of duplicating bars. You can make these bars quickly, store them in your tool crib.

Only two duplicating bars are required for each job — one for the table, one for the cross slide. They're made of standard ¾" bar stock, drilled for each hole to be produced in the work. Once the bars are set and the work initially positioned, the operator simply presses a button — rapid traverse motors take over, and in seconds the work is ready for the next operation.

A new Fosdick Automatic Positioning Machine in your shop will pay for itself many times over through savings in man-hours, set up time, materials and storage space. For more information write today for Bulletin JBA.

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK



Replace 2 lathes in your shop

...with this new RIVETT 1020S TOOLROOM LATHE

RIVETT 1020S has what it takes to make an outstanding lathe!

■ 40% heavier than comparable lathes. Weighs 4000 lbs. ■ Back gearing for power cuts—belt drive for high speed. Range from 22 to 3600 R.P.M. ■ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ■ High spindle speeds through mechanical drive. ■ Push button controls for complete operation. ■ Neutral clutch stops spindle without stopping drive. ■ Three bearing mounts for spindle. ■ Collets mount directly in spindle. ■ Hand wheel for turning headstock spindle. ■ Anti-friction bearings used throughout. ■ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ■ Automatic lubrication. ■ Hardened and ground feed screws.

No need to have both an instrument lathe and an engine lathe when this new Rivett 1020S combines the features of both! Here you get feather-touch sensitivity at 3600 R. P. M.—or the ruggedness for a ¼" cut at .020" feed in cold rolled steel. It qualifies for any work within its 12½" swing and 20" centers.

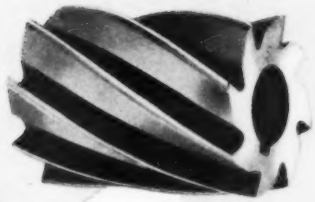
The beauty of this amazing machine will delight the heart of any tool man. Look at the features listed here and then *get all* the facts on what makes the 1020S the outstanding lathe investment.
Write for Bulletin No. 1020A.

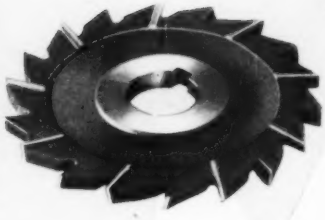
RIVETT

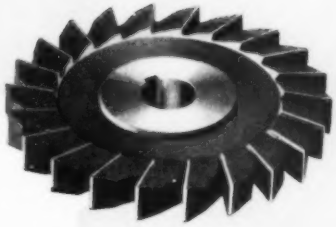
LATHE & GRINDER, Inc.

Dept. AMR-11 Brighton 35, Boston, Massachusetts

For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS*, The Master Craftsman's Master Tools







Clean-Cutting, Long-Wearing Cutters that turn out high production at top efficiency

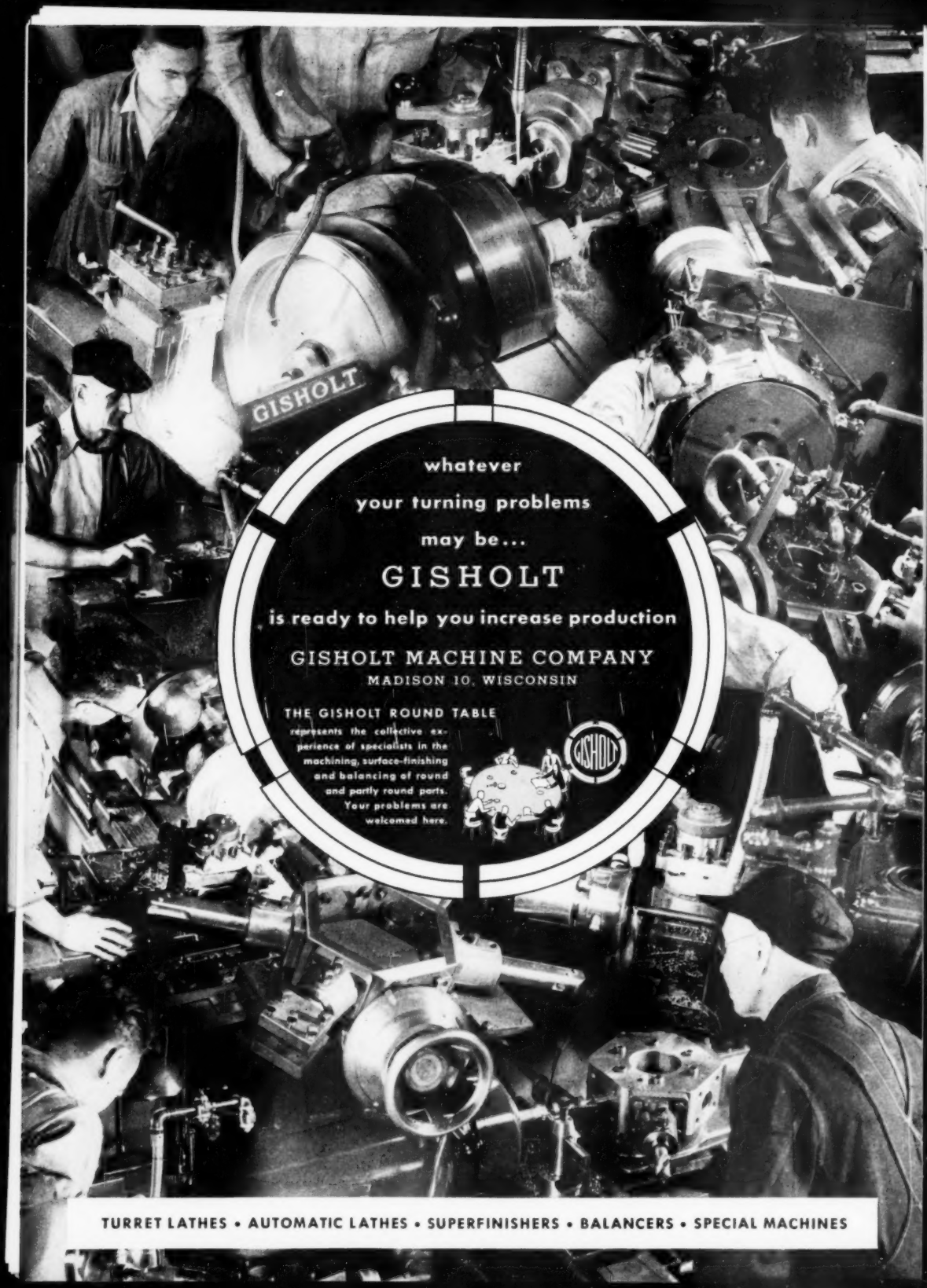
The complete line of quality cutters made by Brown & Sharpe is designed to help you get top machine productivity at all times. Their longer wearing qualities mean a longer period of efficient cutting between sharpenings.

Styles include every type from plain milling cutters and end mills to metal slitting saws and cutters for special uses. Write for complete catalog.

Brown & Sharpe Mfg. Co.,
Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S


GISHOLT
whatever
your turning problems
may be...
GISHOLT
is ready to help you increase production
GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.
GISHOLT
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

first & finest!

Jones & Lamson Radial Chaser Die Heads

GROUND with THREAD CHASERS

These Die Heads will do an outstanding job on large or small lots, in pitches ranging from extremely fine to coarse multiple Acme.

They are versatile tools with an over-all capacity of from No. 8 to $4\frac{1}{4}$".

They require no more than the proper chasers to cut either right- or left-hand threads. No extra equipment is needed.

They are easy to install and simple to handle. For almost half a century J&L Dies and Chasers have been the answer to a multitude of threading jobs throughout the world.

Look at these features that make them leaders in their field and give you better threads at lower cost:

STRENGTH

Every part is of solid steel, hardened and precision ground. There are no built-up sections. Dependability and ultimate capacity are assured.

FLOAT

All models are built with both concentric and longitudinal float.

DUAL-DIAMETER CONTROL LEVER FOR ROUGHING AND FINISHING CUTS

Heavy rough cuts, followed by light, accurate finish cuts can be taken with the same set of chasers by merely moving the roughing attachment lever. This is often a chaser saver on heavy, coarse pitch jobs, especially where short chamfers are a requirement.

SIZE ADJUSTMENT

The external micrometer adjusting screw provides simple and precise setting to exact pitch diameter. It is easy to set and maintain sizes well within your thread tolerances.

RAPID CHASER CHANGE-OVER

Chasers are removed for resharpening, or size replacement, by merely removing the front cover of the Die. No tools are required. Change-over is a matter of seconds — which means more hours available for production.

Write to Dept. 710 for illustrated catalog and complete information.

Thread Tool Division

JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835

Specify *American* Broaches

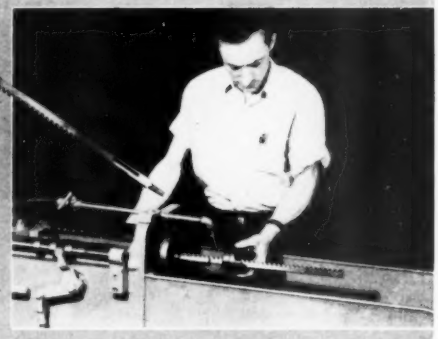
For the best results use American broaches —whether you broach keyways or drive gears.

BROACHING MOTOR COUPLINGS WITH AN AMERICAN STANDARD KEYWAY BROACH

A simple operation yet requiring accuracy is the production broaching of keyways in motor couplings.

In this tooling set up the operator is not required to remove the American keyway broach from the pull head as he threads the part over the broach onto a work horn. High production is obtained as a part is loaded on each return stroke.

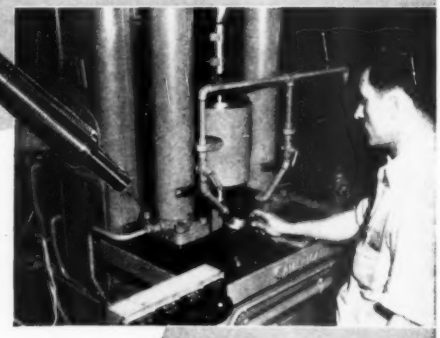
Whether your problem is keyways or complicated involute splines, American broach engineers can design the proper broach to produce parts to your requirements.



FINISH BROACHING AUTOMATIC TRANSMISSION DRIVE GEARS

The prime requirement of automatic gears is silence in operation and long life. American broaches are used to finish the drive gear's helical involute teeth on the American machine shown to the right. No further internal machining is necessary on these gears which must pass rigid tests before final assembly.

Let American quote on your broaching requirements — machines, broaches and fixtures. Send a part print and full information.



COMPLETE BROACHING INFORMATION

Over 5,000 copies of Catalog 450 have been distributed . . . get your copy now of this informative data book on American Broaches. Photographs . . . drawings . . . charts and case histories of broaching tools. Write today for your copy!

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

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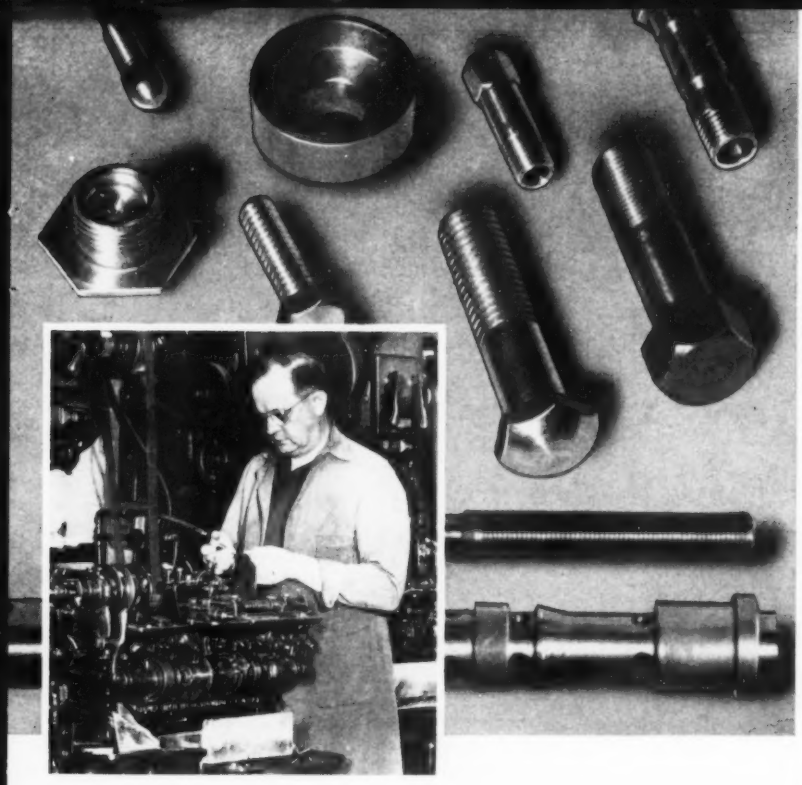
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



How one cutting oil cuts costs

Production at this Michigan screw machine products plant includes a wide range of parts made of brass, copper, bronze, aluminum, steel, and stainless steel. STANICUT Cutting Oil 107 BC is used across the board.

Adopted on the recommendation of a Standard Oil lubrication specialist, STANICUT has resulted in a consistently fine finish with no troubles from corrosion. And, since it is used for a variety of operations, STANICUT has resulted in simplified stocking of cutting oils and lower costs.

Consider the job STANICUT is doing for this manufacturer. Then ask yourself: "Why use two when one will do?" Perhaps a single grade of STANICUT can replace two or more conventional cutting oils in your own plant . . . and help you cut *your* costs. A call to your local Standard Oil office is all that's necessary to put a lubrication specialist to work on your cutting oil problem. Why not do it today? Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANICUT
TRADE MARK
Cutting Oil

What's your problem?

Meet C. P. Smith, lubrication specialist with headquarters at Standard Oil's Grand Rapids office. He's the man who recommended STANICUT Cutting Oil 107 BC to operators of this plant and helped them make important savings in operating costs.

C. P. Smith is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. They have been specially trained in Standard Oil Lubrication Engineering Schools and in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course. Ask him to explain the advantages of such fine products as:

STANICOOL HD Soluble Oil Because it contains additional compounding, this soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical application. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.

STANDARD OIL COMPANY

STANDARD *(Indiana)*

Longer bearing life on the "milk run"

Here's evidence of the superior lubrication that a midwest milk processing plant is getting through the use of STANOLITH Grease No. 42. This pump arbor and its anti-friction bearings have been run for a year under conditions of extreme dampness . . . yet there is no appreciable wear, no corrosion.

High maintenance costs and frequent replacement of bearings in both electric motors and pumps had been a direct result of excess humidity in the plant, until a Standard Oil lubrication specialist recommended the use of STANOLITH. After a test run, it was adopted throughout the plant. Now, after a full year of operation, STANOLITH Grease No. 42 has meant a 50 percent reduction in bearing replacements. Corrosion troubles have been eliminated.

STANOLITH's extreme resistance to water has payed off for this user. For your own application, STANOLITH's heat-resistant properties may be most important. Why not discuss the problem with your own Standard Oil lubrication specialist? Just call your local Standard Oil office for his service. Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

STANOLITH
TRADE MARK
Greases

What's your problem?

R. L. Hansen, of Standard's Green Bay office, is the lubrication specialist who recommended STANOLITH Grease No. 42 and helped this processor make important savings.

He and other lubrication specialists are located throughout the Midwest. They are ready to give you prompt and expert attention. If you have a lubrication problem, the lubrication specialist nearest you is the man to see.

He has been specially trained for his job in Standard Oil schools, and in addition, he has plenty of practical experience which qualifies him to give you thorough and reliable service. A phone call to the nearest Standard Oil office is all that's necessary to place him at your service. When he calls, ask him to discuss with you the performance records of the following fine products:

STANOIL Industrial Oils—This general-purpose line of oils provides cleaner operation of hydraulic units and supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears, better internal lubrication of wire rope.

STANDARD OIL COMPANY **STANDARD** *(Indiana)*

FOR PIECEWORK OR PRODUCTION-LINE OPERATION

VAPOR DEGREASING

GIVES YOU SPEEDY, EFFICIENT METAL CLEANING

...MANUALLY OPERATED

A vapor degreaser is ideal for cleaning small parts. Equipment is simple, timesaving and easily operated.

...CONVEYORIZED

Cast iron compressor blocks for refrigerator units are carried by conveyor through a vapor degreaser. Conveyor systems are frequently used in vapor degreasing to maintain high production in larger scale operations, or when heavier parts are being handled.

Any size or shape part, no matter how intricate, is thoroughly cleaned by vapor degreasing with Du Pont "Triclene" D Trichlorethylene. Parts come out clean, warm and dry, instantly ready for the next operation. And the heaviest oils and grease are often removed in less than a minute!

Compact, efficient vapor degreasing equipment is available to meet a wide range of production capacities. Whatever the type unit, "Triclene" D is recommended to give you the best possible performance. With it comes Du Pont service and an experienced organization to assist your metal cleaning program.

"Triclene" D has been used for metal degreasing for many years by thousands of plants. It's the most stable, the best, degreasing solvent we know how to make. It stands up under moisture, air, heat and other contaminating, destructive influences which may be found in degreasing.

"Triclene" D is so pure that control and maintenance of degreasing operations are easy and economical. And it's readily recovered for re-use from sludge and residue because of its narrow boiling range.

The coupon below will bring you the facts about vapor degreasing with "Triclene" D.

Mail the coupon below for more facts on vapor degreasing.

non-flammable
DU PONT SOLVENTS for VAPOR DEGREASING

SOLD NATIONALLY THROUGH DISTRIBUTORS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Delaware

Please send me detailed information on Vapor Degreasing: applications, advantages, equipment used, and Du Pont solvents available. We are interested in cleaning _____ products.

Name _____ *Position* _____

Firm _____

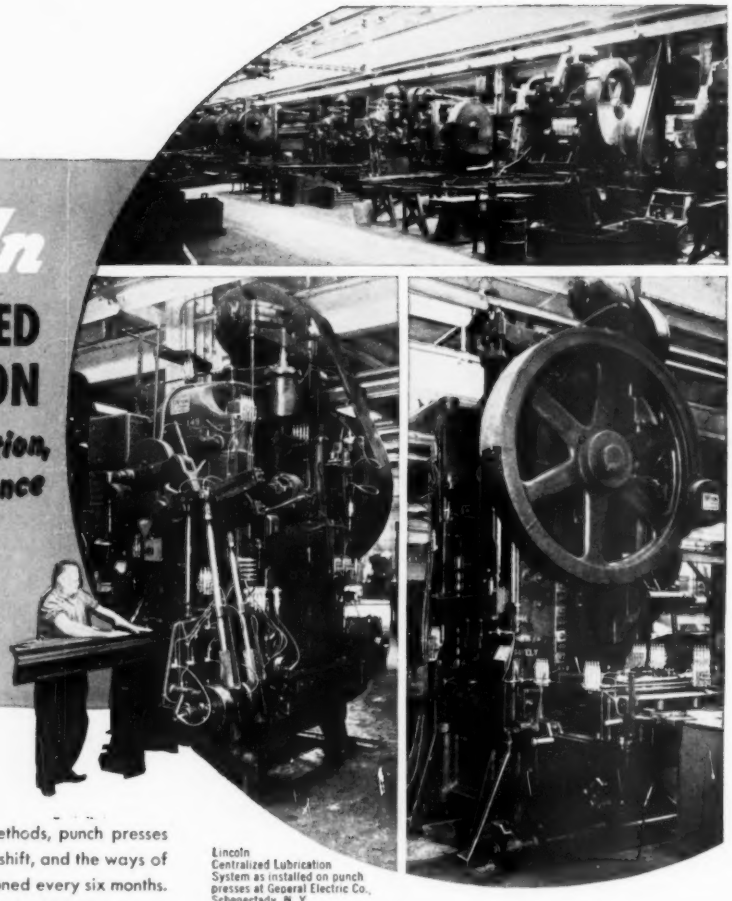
Street and No. _____

City _____ *State* _____

Lincoln CENTRALIZED LUBRICATION

Increases Production, Lowers Maintenance Cost . . .

At General Electric Company, Schenectady, N. Y.



Lincoln Centralized Lubrication System as installed on punch presses at General Electric Co., Schenectady, N. Y.

The Problem:

When lubricated by hand methods, punch presses were serviced only once each shift, and the ways of the slides had to be reconditioned every six months. The once-a-shift lubrication required 18 minutes per press during which time production was at a standstill.

The Solution:

LINCOLN CENTRALIZED LUBRICATION was installed on 2 batteries of 20 punch presses each. These presses now receive complete, automatic lubrication every 15 minutes.

These presses have functioned for more than 2 years without needing reconditioning. Bearing failure has been reduced to almost nothing. Maintenance costs and production lost due to down time for repairs have been greatly reduced.

In addition, Lincoln Centro-Matic* Lubrication, while the machinery is in motion, means an 18-minute gain in output for every press, every shift.

Reduce Maintenance Down-Time in Your Plant with *Lincoln* Centralized Lubrication

SEE OUR CATALOG IN SWEET'S

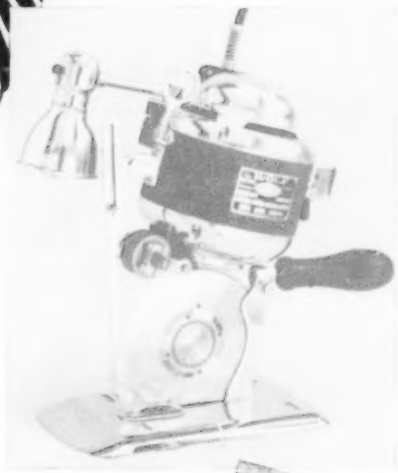
Lincoln's lubrication system specialists will work with you and recommend the time and money saving Centralized Lubrication System best suited to your equipment. Write for name of your nearby Lincoln Distributor.

DISTRIBUTED NATIONALLY THROUGH LEADING MILL SUPPLY HOUSES AND INDUSTRIAL WHOLESALERS LOCATED IN PRINCIPAL CITIES

Apply the Right **LUBRICANT** in the Right **QUANTITY** at the Right **TIME**

• • • PIONEER BUILDERS LINCOLN LUBRICATING EQUIPMENT • • •

LINCOLN ENGINEERING COMPANY • 5754 Natural Bridge Ave. • St. Louis 20, Mo.



WOLF Cloth Cutters Gain Extra Years of Smooth, Quiet Operation With G.S. Small Gears

The Wolf Machine Company designs their cloth cutters "for the special convenience of the operator, to insure the highest production with a minimum of effort." Sixty years of manufacturing to highest precision standards has won an enviable quality reputation for these fine machines.

G.S. is especially pleased to have been chosen to mass produce the Fractional Horsepower Gears for Wolf Machines. We accept this responsibility secure in the knowledge that G.S. skill and experience will uniformly produce Gears to meet their most exacting specifications.

If you, like the Wolf Machine Co., are extremely particular about the Small Gearing you use, then by all means, entrust the job to G.S.! You see . . we've *specialized* in making *better* Fractional Horsepower Gears for more than 30 years. More and more quality-minded manufacturers from coast-to-coast look to us for their needs. Let us give you ideas, suggestions, or cost estimates. Mail us drawings or specifications today!

SEND FOR . .

Free new 6-page folder illustrating and describing G.S. facilities, Small Gearing and applications, together with handy charts. Will you ask for it on company stationery, please?

FRACTIONAL HORSEPOWER GEARING

GS

GEAR Specialties, Inc.

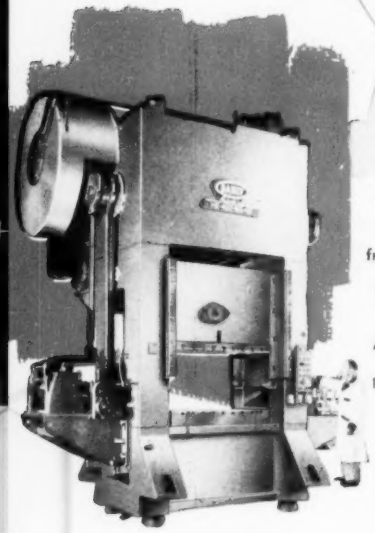
Spurs · Spirals · Helicals · Bevels · Internals · Worm Gearing · Racks · Thread Grinding

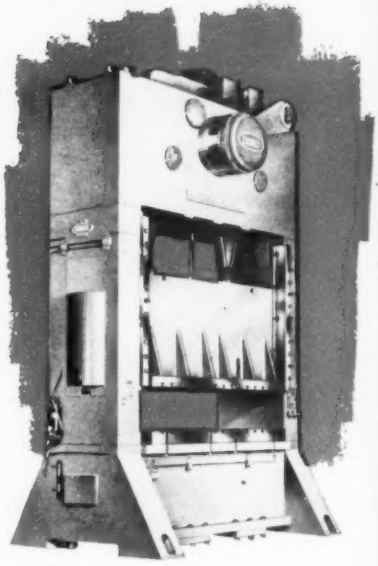
2635 WEST MEDILL AVENUE · CHICAGO 47, ILLINOIS

MEMBER OF

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

...to increase output!



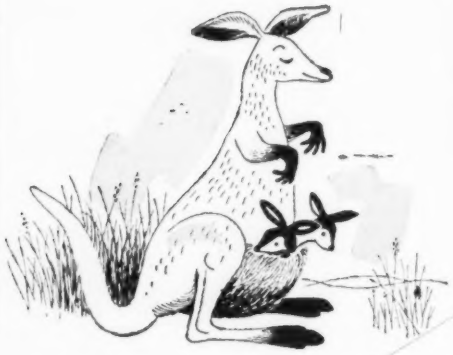


Danly Autofeed Presses feature greater frame rigidity for each rated capacity, reducing vibration and deflection at higher operating speeds. Production of stampings is increased, dies last longer.

Actual production figures* show where Autofeed presses are tripling production using the same dies formerly used on conventional presses of the same tonnage. Likewise, in some instances dies are lasting three times as long between regrinds on Autofeed presses.

Industry's Leaders

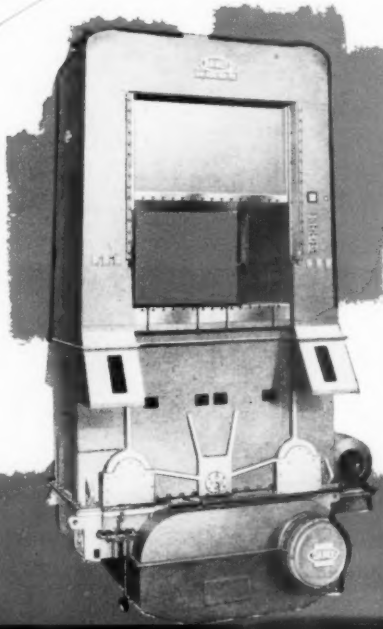
DANLY



...to facilitate material handling!

Danly Underdrive Presses, single, double and triple action, are built to clear the working floor for the main function of production. Access required for either major maintenance or service is provided for on a separate subfloor beneath the main working floor.

Many of these presses are being installed in some of this country's most modern stamping plants.* Today, modern trends in automatic material handling are being proved through the dependability of Danly Underdrive Press operation.

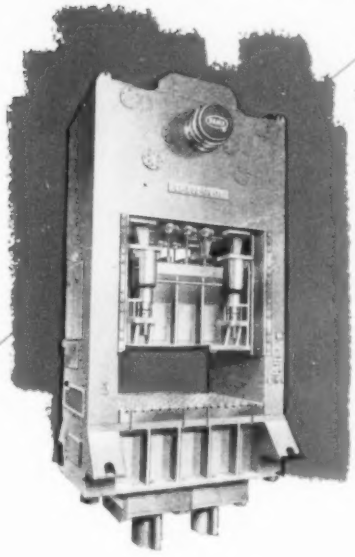


Danly Single Action Straight Side Presses like this, with automatic lubrication and the exlcusive Danly Cool Running Clutch, are setting new industrial standards for press dependability.

In one leading farm equipment plant* careful shop records indicated average maintenance requirements of only two and one-half hours per week for a 12-month period—and most of that time was consumed in routine press attention!

...to reduce costs!

...to save manhours!



Danly Double Action Presses are well suited to head up lines producing deep drawn stampings. Features like Danly's Cool Running Clutch offer added dependability so vital in production line operation.

In a large automotive plant* a Danly 500-ton press, single stroking 300 times an hour day and night, has not even required clutch adjustment for lining wear after six months.

Choose PRESSES

You find Danly Presses in the plants that set America's production pace because they're designed and built to increase output and reduce costs at the same time. Unique operating features like the Danly Cool Running Clutch together with extra rigid precision construction and automatic lubrication permit longer uninterrupted production runs—save costly down time.

Write today for detailed literature on any of the Danly Press types shown here—or call a Danly press engineer for discussion of your specific stamping problem.

DANLY®

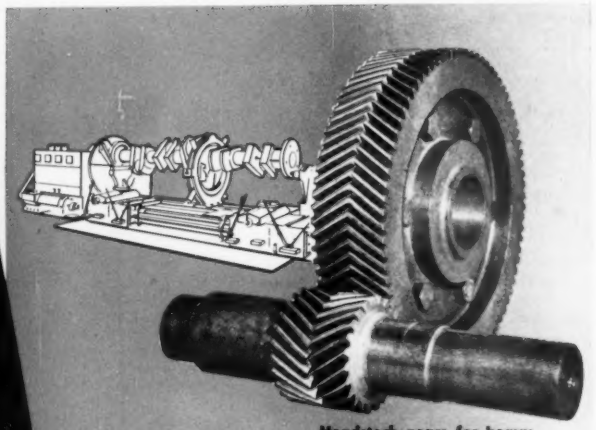
IT COSTS LESS TO RUN A DANLY PRESS!

DANLY MACHINE SPECIALTIES, INC.

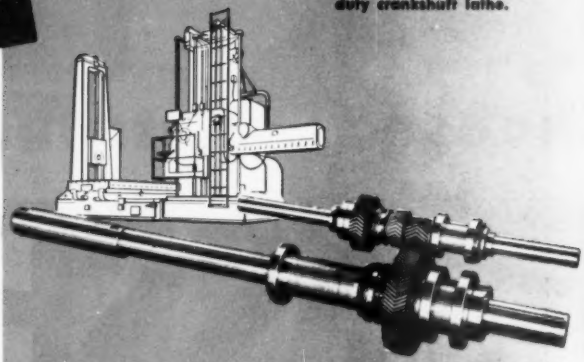
2100 South Laramie Avenue, Chicago 50, Illinois

MECHANICAL PRESSES . . . 50 TO 3000 TONS

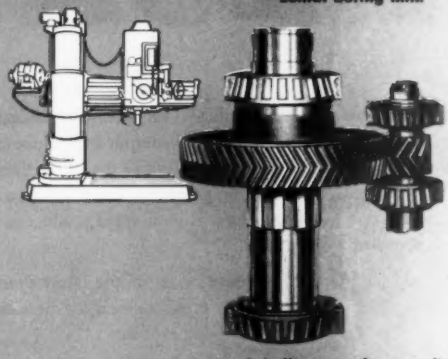
WHEN PRECISION IS VITAL *specify* Farrel Gears



Headstock gears for heavy duty crankshaft lathe.



Gears for driving main and auxiliary spindles of a horizontal boring mill.



Spindle gears for a radial drill.

In many machine tools, *where accuracy is of primary importance,* Farrel herringbone gears are used to transmit a smooth, efficient flow of power to work or tool point.

The quiet, vibration-free performance and long life you can expect from these gears result from extreme accuracy of tooth spacing, contour and helix angle, and other qualities inherent in the Farrel-Sykes method of gear generation. They are made of the finest grade materials, in a complete range of sizes for any power capacity and any application.

Wherever power transmission must be smooth and vibrationless under all conditions of load and speed, *specify Farrel herringbone gears.* Information and engineering assistance available, without obligation.

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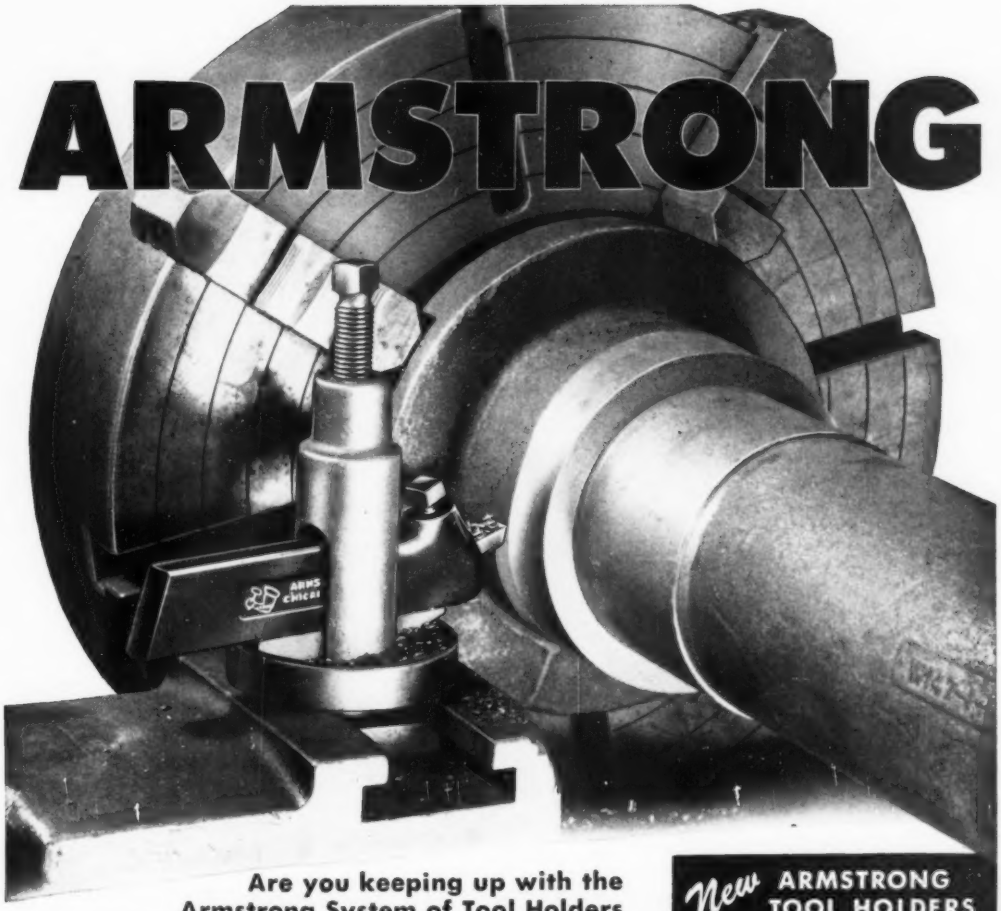
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

Farrel-Birmingham

FB-698

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

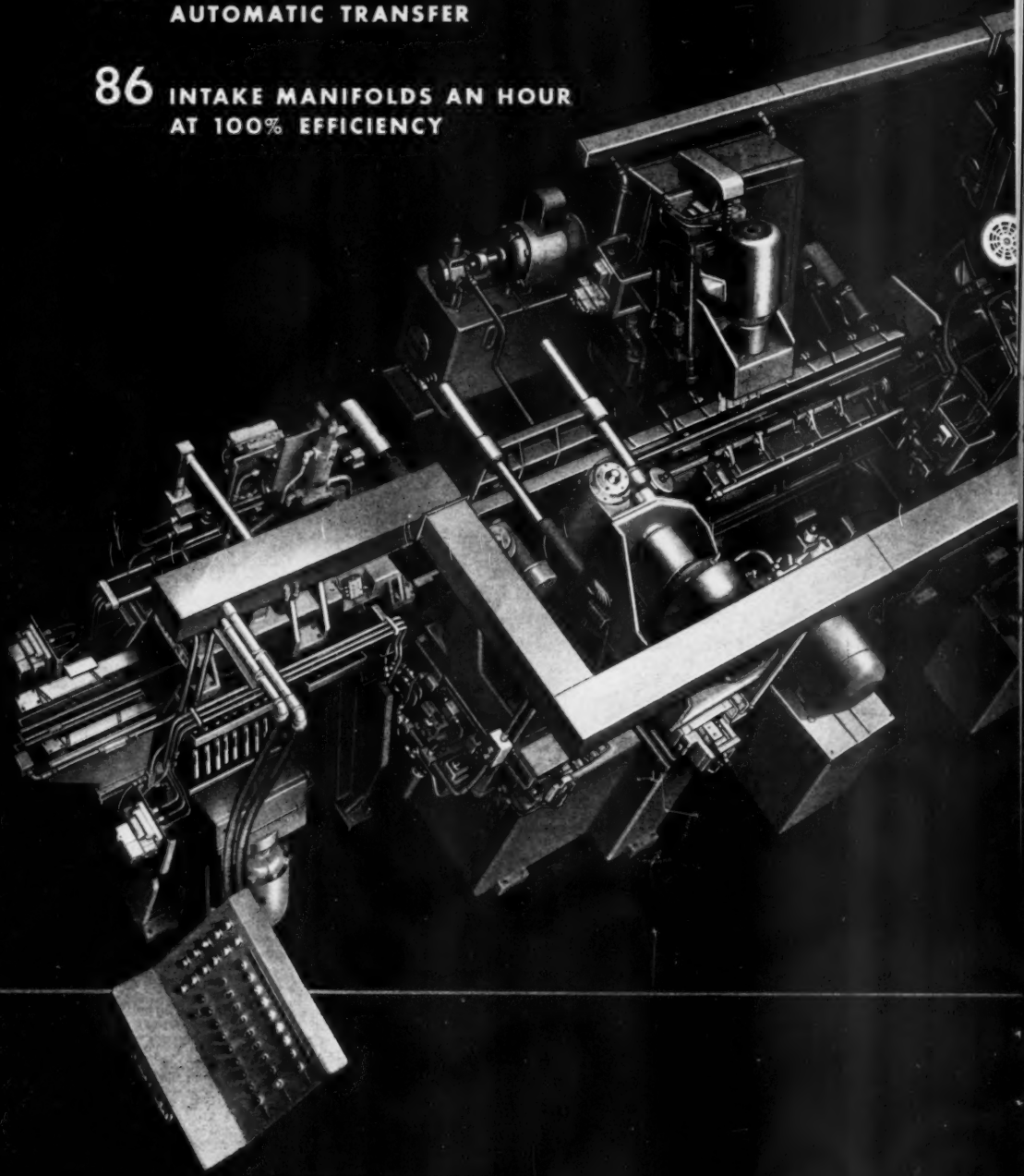
WRITE FOR CATALOG

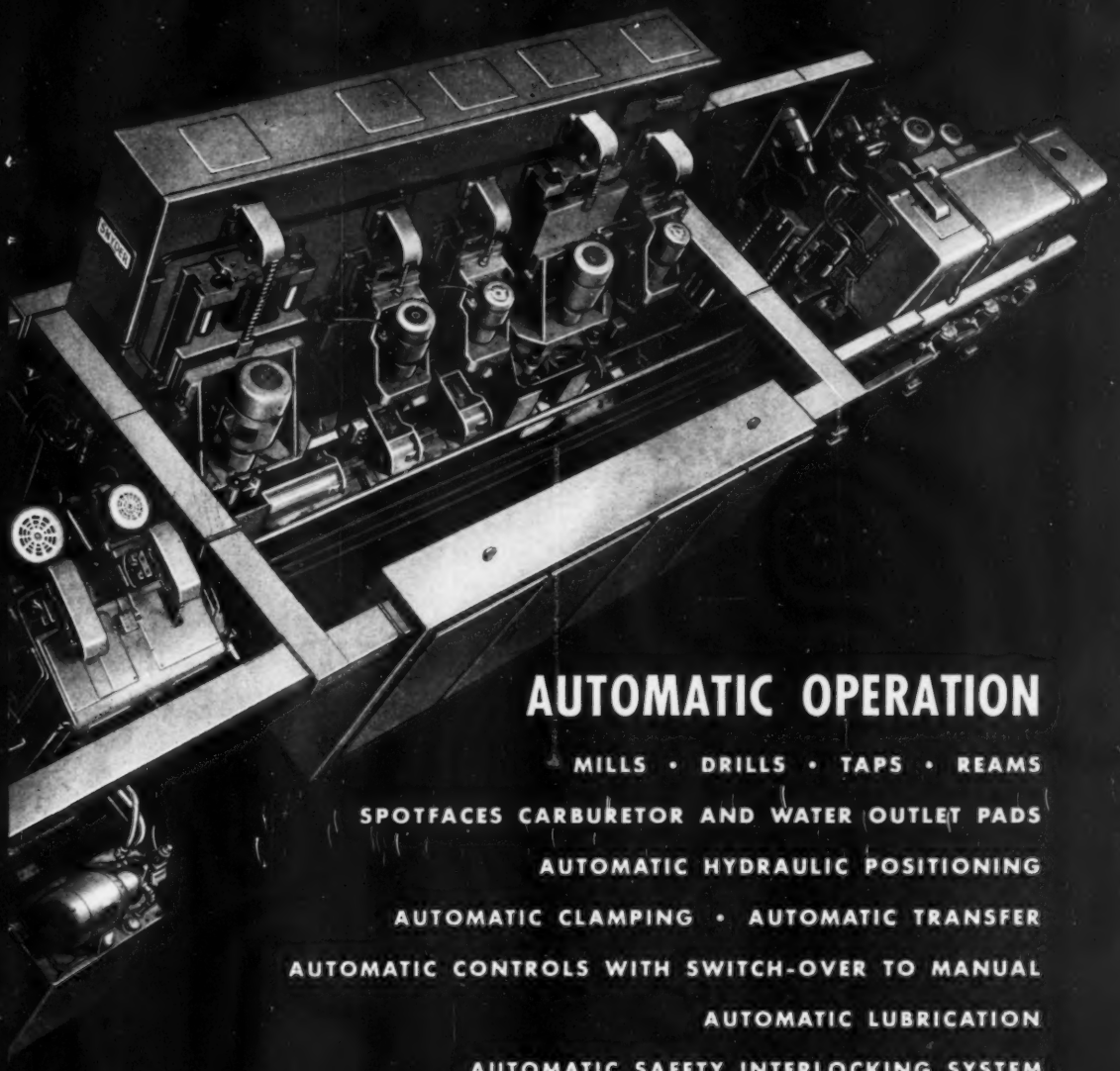
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

SNYDER MACHINES CONTROL COSTS

22 STATION
AUTOMATIC TRANSFER

86 INTAKE MANIFOLDS AN HOUR
AT 100% EFFICIENCY





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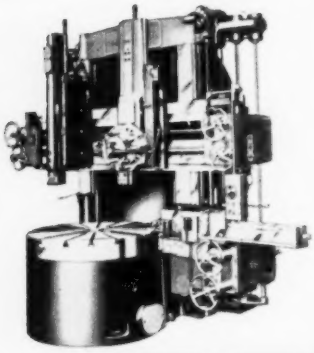
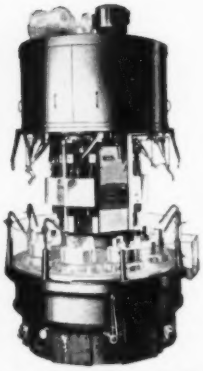
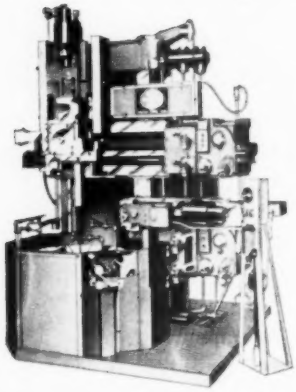
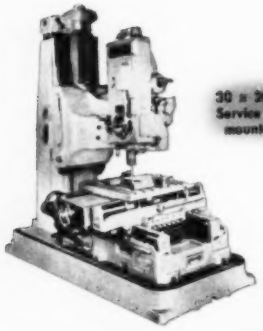


Cut Master Vertical Turret Lathes in six sizes 30" — 36" — 42" — 54" — 64" and 74". The 30" and 36" sizes have two heads while 42" — 54" — 64" and 74" have three heads also made in various combinations

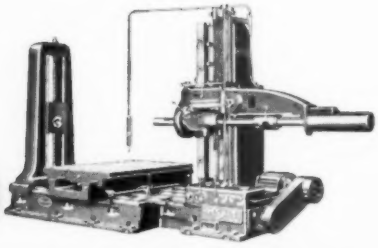




Mult-Au-Matic Type "B" 8" — 12" — 16" with 5 or 8 spindles, Type "D" 16-25 and Type "K" 6 spindles — twin 6 spindles — 8 spindles and 8 twin spindles

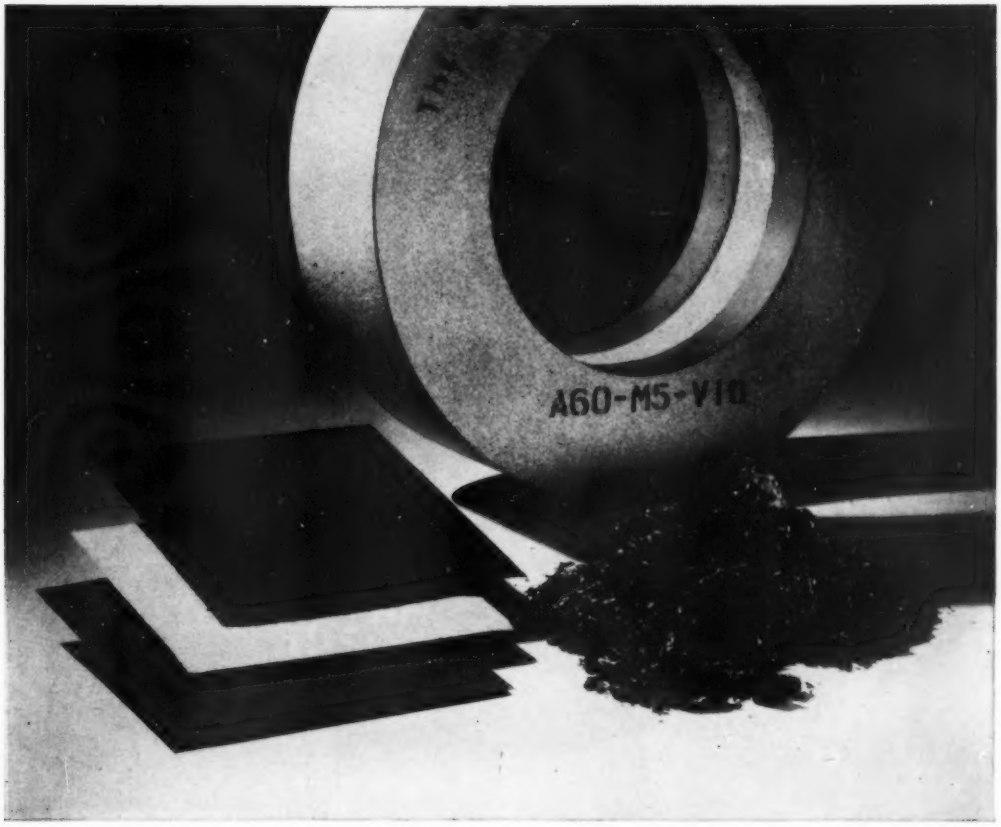


30 x 30 Spacing Table mounted on Super Service Drilling Machines. It may also be mounted on 4' — 5' or 6' Radial Drills



4" and 5" Spindle Horizontal Boring, Milling and Drilling machines are available with various Bed Lengths and Post Heights

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT U. S. A.



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Do you know when you are realizing the best available efficiency in your abrasive methods? Chances are, you're getting close if you buy abrasives by CARBORUNDUM. A *complete* line of abrasive products makes it possible for experienced CARBORUNDUM salesmen and distributors to recommend, and for you to select, that single abrasive product that will give you *complete* results. With the right product, you know you're operating at top efficiency, getting the most out of your abrasive methods, saving expenses, producing better.

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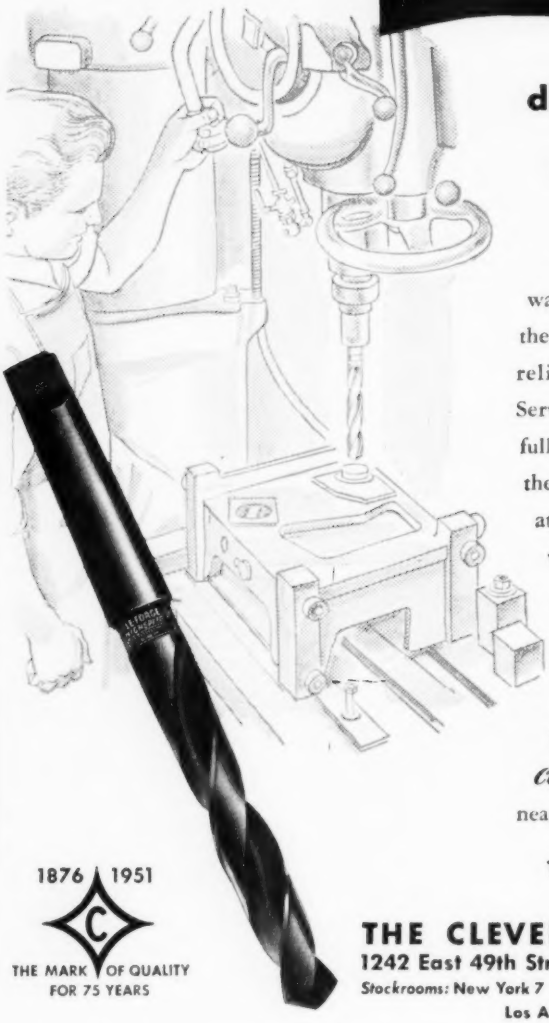

drills hole 3½ in. deep in 18-8 stainless steel

This was a slow and difficult job. There was considerable tool breakage, even though the operator made several pull-outs for chip relief on each hole. ◈ When a *Cleveland* Service Representative was called in, he carefully analyzed the set-up . . . and recommended the CLE-FORGE High Speed Drill illustrated at the left. This is a stock drill with a heavy web, and with flutes designed for easy chip removal. Now—because of the greater strength and rigidity of this drill—the deep holes are drilled in one pass. Breakage has been greatly reduced. ◈ Whenever *you* have a drilling problem, get the advice of a *Cleveland* Service Representative. Contact our nearest Stockroom, or . . .

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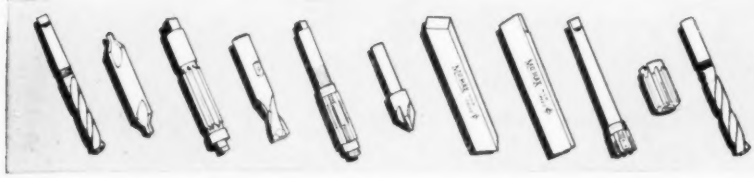

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FOR QUALITY PERFORMANCE

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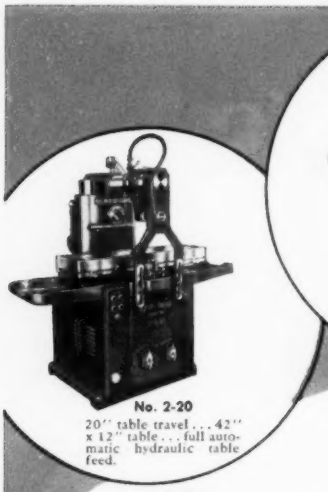
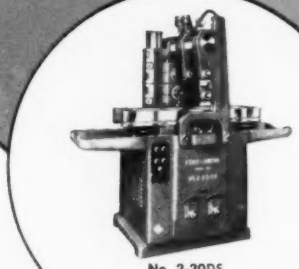
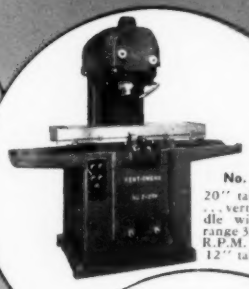


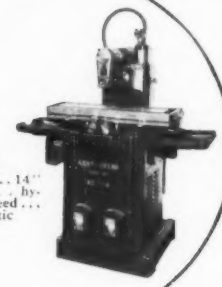
No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.



No. 2-20DS
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.



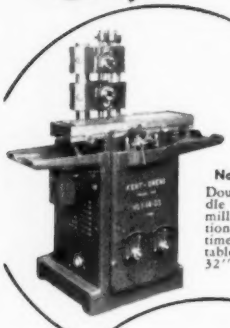
No. 2-20V
20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Speed up YOUR MILLING!

Get top-speed milling with high accuracy . . . put the work on Kent-Owens Machines! They're outstandingly rugged . . . efficient . . . dependable. Designed with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more . . . save labor . . . reduce costs!* Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.



No. 1-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

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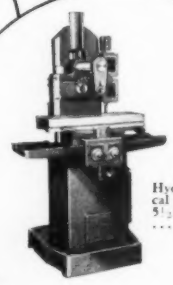
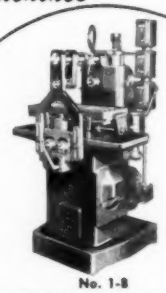
No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head-counter-balance.

KENT-OWENS
Milling Machines



No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.



No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.

What deburrs clutch discs three times as fast?

...a brush! To make tractor clutches operate smoothly, all burrs and sharp corners had to be removed by hand-filing and brushing the clutch disc teeth. Now, a five-station rotary automatic machine equipped with Osborn power brushes gets these results:

Triples output. Releases skilled personnel for other defense work. Assures uniform finishing of *every* disc for dependable clutch performance.

An **O**sborn **B**rushing **A**nalyst will gladly study your product-finishing and cleaning operations to suggest ways to speed production and cut costs. Call or write *The Osborn Manufacturing Company, Dept. 562, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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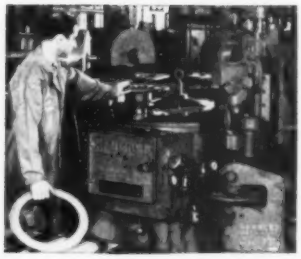
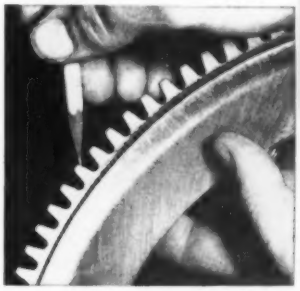


THE MACHINE . . . *a 5-head rotary automatic is used by this manufacturer to mechanize the brushing of clutch disc teeth. Each brush is powered by a 5 h.p. motor and rotates at 1750 r.p.m.*

THE OPERATION. *Four of the stations brush across the teeth like the one shown above. Fifth station brushes* into *the teeth.*



THE RESULTS. *Output is tripled. Manpower is conserved. Every disc is thoroughly and uniformly deburred. When clutches are assembled and tested, they operate smoothly and efficiently.*

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600 series

a better bearing bronze

containing no hard-to-get tin

Four typical parts forged from Mueller Brass Co. "600" series Bearing Bronze.

If you use gears, connecting rods or other parts of bearing metal in your products, it will pay you to investigate Mueller Brass Co. "600" series, a forgeable bronze that *contains no critical tin.* This bearing metal outperforms phosphor bronze and other bearing metals and will save you money in your applications. "600" series bearing metal can be forged into relatively complicated shapes and produces a forging of close-grained homogeneous structure impossible to get in a casting. The forged shape is closer to finished size than a casting and requires less machining. "600" series alloys have a low coefficient of friction, a tensile strength 2½ times greater than cast phosphor bronzes and a high resistance to corrosion. "600" has a 25 year record of outstanding performance on some of the toughest bearing applications. There is a "600" series alloy with the properties to fit your bearing metal needs . . . write today for further facts.

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Close valve coupling makes for greatest pneumatic efficiency

And The Bellows Air Motor

Is the only Air Cylinder with a Built-in Valve

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In pneumatics operation the more remote the valve from the cylinder the greater the possibility of erratic cylinder performance. In the Bellows Air Motor the valve is integral with the cylinder. This integral construction means *instant* action. No lag, no time delay, no air flow restriction. Integral construction means *positive control.* Directional control . . . speed control. Integral construction means *compactness.* Space saving design . . . simplified installation in cramped quarters, or on moving machine elements.

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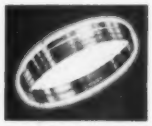
—for a wide variety of hand and machine metal cutting operations.
Four types: HIGH SPEED STEEL; DI-MOL; CHROMOL*; and DURAFLEX*.



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A complete line—Hard-Edge Flexible Back, in both regular and buttress tooth patterns. Also Hardened Throughout.

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DISSTON "Fight Waste" PROGRAM

A *free* service for industrial tool users. Individual instruction cards on 31 different cutting tools help workmen get more out of tools and materials, increase production and cut costs by stopping waste. Write for copy of "The Pocket Foreman" containing complete information.

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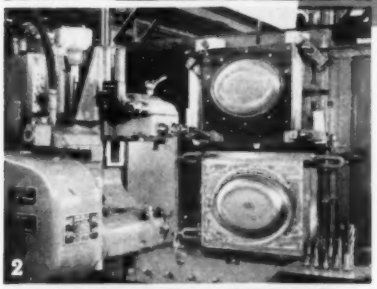

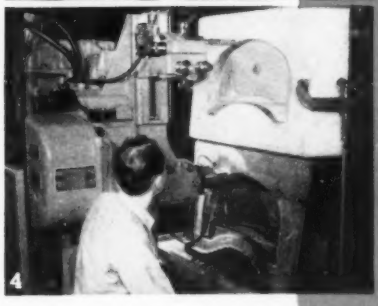

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The advanced design of the versatile P&W Keller Machines gives new speeds and greater reductions in machine-hours for producing all kinds of

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Single jobs or short-run lots in this class of work are automatically precision-machined, faster and with consistent economies — to *any* contour from *any* master form, 2-dimensional or 3-dimensional—on the new KELLER TYPE BL.

1 Milling an intricate draw die for aluminum aircraft wind deflectors by tracing a plaster model.

2 This complete form requires little hand finishing. Mating mold for this plastic serving platter also machined on the Keller BL.

3 Profile-milling an experimental wind tunnel nozzle part, tracing from inexpensive template.

4 Horizontal design of the Keller allows coolant to wash chips from cavity of this tough forming die.

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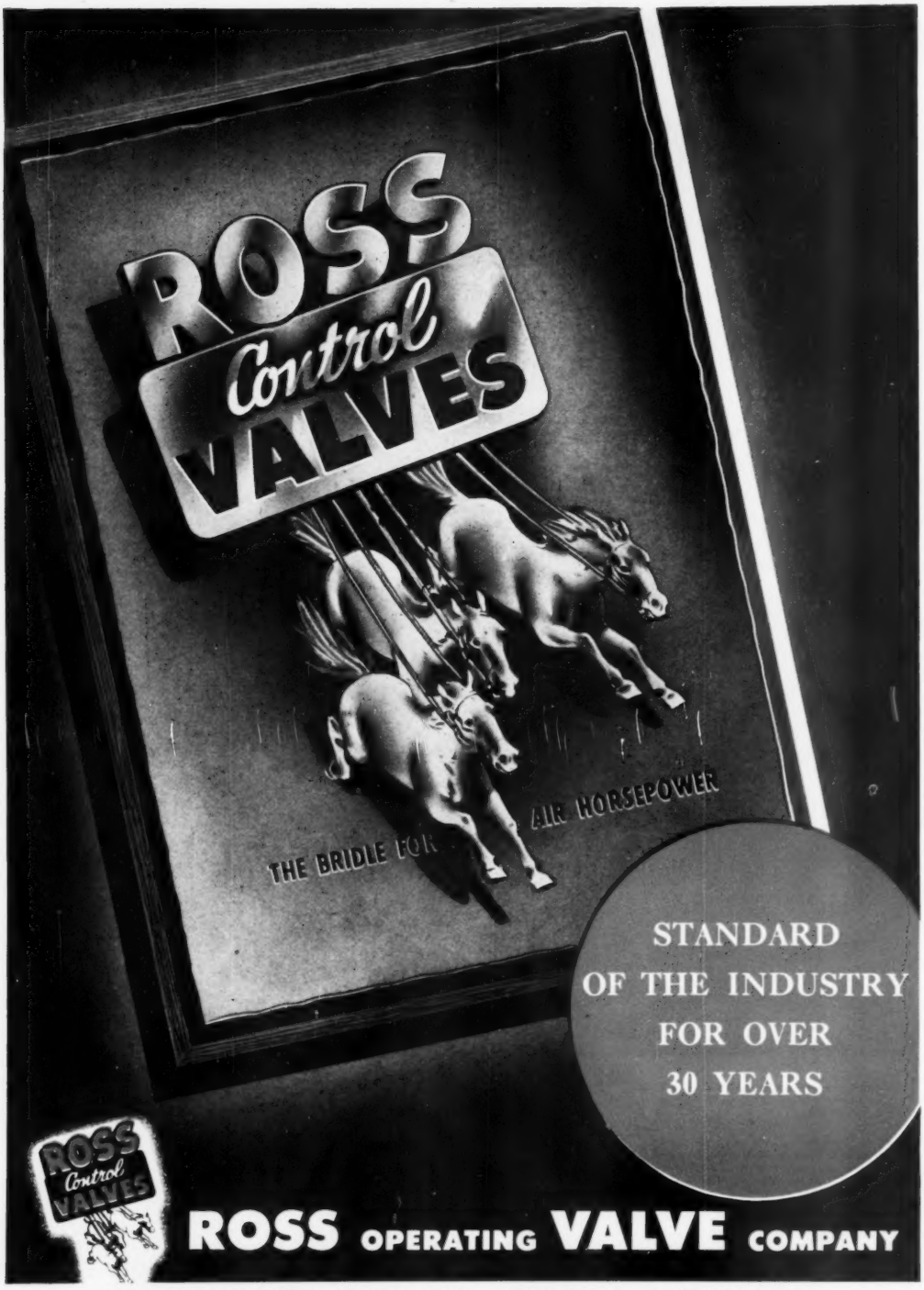

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Change tools without stopping . . . or even slowing the machine

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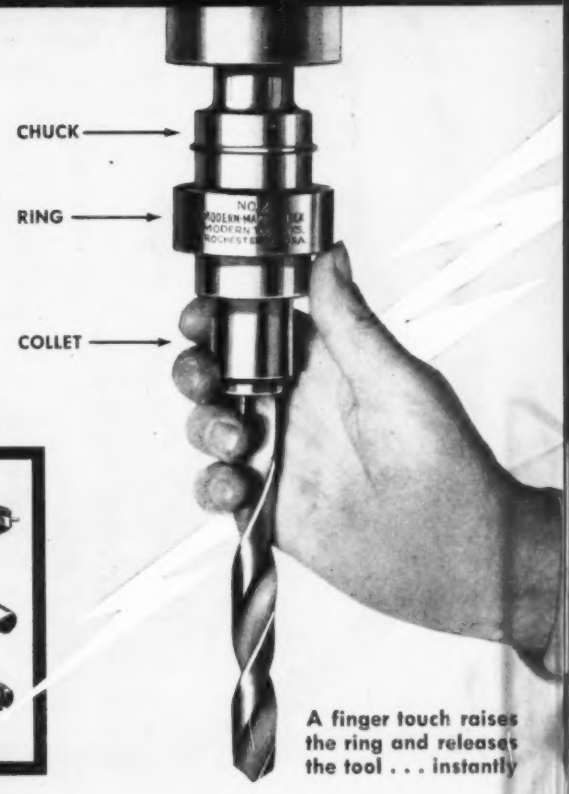
CHUCK and COLLET EQUIPMENT

A few examples of the many tools, shown with collets attached, driven by MODERN-MAGIC CHUCKS



A finger touch raises the ring and releases the tool . . . instantly

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly lost time of revolving spindle machines. Used with such machines, tools are changed without stopping or even slowing the spindle. Changes are made from drill to reamer to tap instantaneously and safely while the machine is running at cutting speed. In this way, the Modern-Magic Chuck and Collet Equipment gives multiple spindle range to single spindle machines, increasing production and cutting cost. In high production shops, it has been proved they save time even though used only for changing from dull to sharp tools.

For full information, send for Bulletin M-103. In addition to standard Modern-Magic Chucks and Collets, it shows special types of each.

Only the ORIGINAL Modern-Magic Chuck and Collet Equipment carry the name "MODERN-MAGIC" and are manufactured by Modern Tool Works, Rochester, N.Y.

MODERN TOOL WORKS

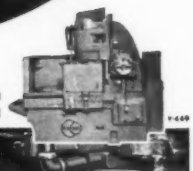
DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

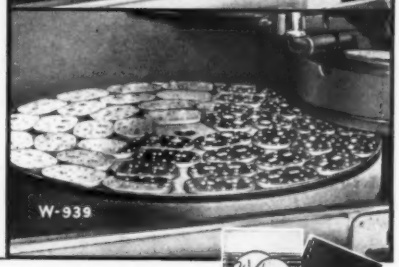
FACTS!

THE BLANCHARD WILL ROUGH GRIND LARGE QUANTITIES OF PARTS FASTER THAN OTHER MACHINES *and* **THE BLANCHARD WILL PRODUCE SURFACE FINISHES AS FINE AS ALLOWED BY THE PHYSICALS OF THE METAL ITSELF**



ROUGH GRINDING possibilities with a Blanchard is illustrated by these refrigerator valve plates. 1/16″ of stock is removed from both sides of the rough cast iron parts. 44 pieces are ground per load at a rate of 80 pieces per hour (160 surfaces), to limits of ±.002″ for size. A No. 18 Blanchard with a Blanchard 30C40 wheel is used.

FINISH GRINDING these valve plates is done on the same Grinder. With 44 pieces on the chuck, a rate of 100 pieces per hour (200 surfaces) is obtained. .003″ of stock is removed from each side to limits of ±.002″ for size. Surface finish produced on the cast iron is *6 micro inches or better!* A Blanchard 100C15 wheel is used.

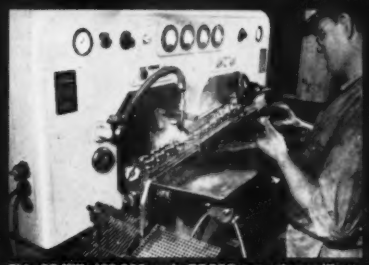


Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

Copper-plating
Carburizing
Cleaning
Rechasing threads
.... Eliminated



This 20 KW, 450,000 cycle TOCCOtron tube oscillator unit handles 600 transmission nuts per hour.

LABOR COSTS Cut 78%

with TOCCO* Induction Heating

THE JOB—International Harvester Company, world-famous builder of farm machinery, uses TOCCO for the selective hardening of the special tractor transmission nut shown above. Only the contact surfaces are hardened. The bottom channel must remain soft or the part will crack, and any distortion would affect the threads. Material is C-1045 steel; production required 600 per hour.

THE RESULTS—Formerly the part was copper-plated before milling the slot. Then the slot was milled, the part carburized and hardened in a batch-type furnace. Finally the parts had to be cleaned and the threads rechased after hardening to assure proper fit. Now the adoption of TOCCO hardening eliminates these operations, stops distortion and saves $3.50 for every batch of 600 pieces.

This job, typical of thousands of cost-saving TOCCO installations all over the world, may suggest ways you can reduce costs and speed production on hardening, brazing, annealing, forging or melting jobs in your own plant. Experienced TOCCO engineers are glad to work with you—without obligation, of course—for similar cost-cutting results.

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Mail Coupon Today

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Dept. B-11, Cleveland 1, Ohio

Please send copy of 60-page catalog "TOCCO Induction Heating."

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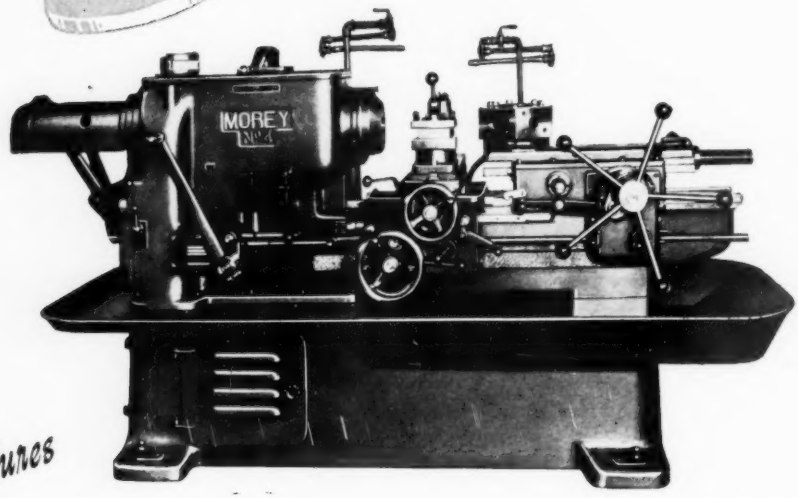
MOREY

TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain	1" x 6"	14"	3 HP
No. 3 Universal	1 1/2" x 10"	16 1/2"	5 HP
No. 4 Universal	2" x 12"	19 1/2"	7 1/2 HP
No. 5 Universal	2 1/2" x 14"	21 1/4"	15 HP

FOR BAR and CHUCKING WORK

OBTAIN MAXIMUM PRODUCTION WITH MINIMUM EFFORT FROM MOREY TURRET LATHES . . . **INVESTIGATE!**

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*CrysCoat

is in Good Company!

*Prepares Metal Surfaces for Painting

*Patented Material and Process

TEAM-UP the husky "Caterpillar" Scraper with the "Caterpillar" Diesel Tractor and you've got a couple of sluggers ready to tackle any earth-moving job that comes along. Typical of "Caterpillar" thoroughness is the paint finish. It, too, is designed to take terrific punishment. That's why these big yellow sluggers are CrysCoated before painting. The Oakite *CrysCoat* Process assures long-lasting paint adhesion; prevents peeling; resists corrosion.

The Oakite *CrysCoat* Process may be just what you're looking for. With minimum equipment . . . in minimum time . . . at minimum cost you can (1) clean metal surfaces and condition them for painting; (2) improve the adhesion of paint to metal; (3) prevent corrosion before metal is painted; (4) localize corrosion under paint if finish is broken.

The Oakite *CrysCoat* Process Offers These Extras:

1. **Eliminates operations . . . uses less equipment**
2. **Cuts operating time**
3. **Uses less chemicals for cleaning and conditioning**
4. **Reduces heating costs**
5. **Saves cost of expensive acid-proof tanks and equipment**
6. **Saves cost of frequent descaling and desludging**
7. **Drag-out costs are less because of low original cost of solution**
8. **Saves paint**
9. **Cuts cost of rejects caused by rusting before painting**

FREE . . . illustrated folder describes the Oakite *CrysCoat* Process for use in before-paint-treatment of steel, aluminum sheet and castings, zinc die castings and galvanized surfaces. If you are engaged in the fabrication of civilian goods or the speedy production of defense orders—send for Folder F7642.

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Technical Service Representatives in Principal Cities of U. S. & Canada

SPECIALIZED INDUSTRIAL CLEANING

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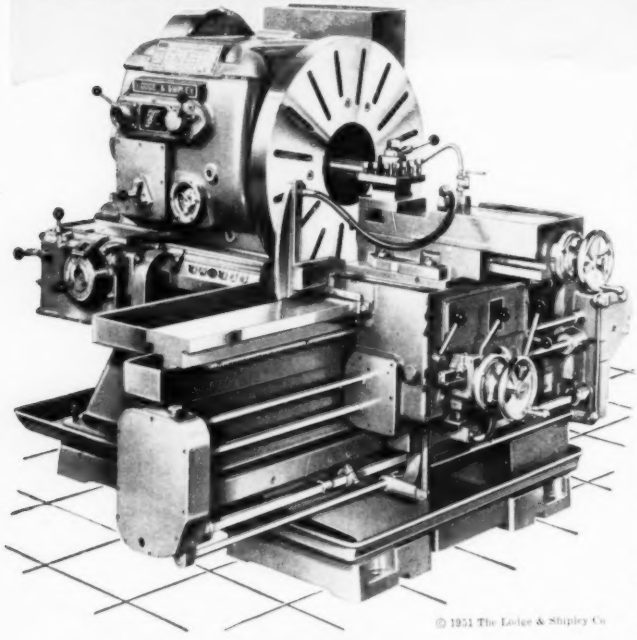
There's only ONE Lathe for "T-Turning"

The revolutionary new LODGE & SHIPLEY T LATHE

for thin-wall, short length, large diameter work *with these outstanding T LATHE Advantages:*

- **Costs less than conventional machines**
- **Saves 50% or more in floor space**
- **Makes large, cumbersome engine and raised lathes obsolete**
- **Unique T Lathe design facilitates loading and unloading**
- **Enables operator to follow cutting tools to fine dimensions.**



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In a few short months, "T turning" and the lathe that made it possible have gained the acclaim of "show-me" tooling and production men, government machine tool experts and others.

The radically new Lodge & Shipley T Lathe has solved the problem of facing, turning and boring thin-wall section work of large diameter and short length for jet engine components.

Far faster, more sensitive, and much more accessible, the T Lathe is twice as compact, costs far less than oversize lathes or vertical boring mills formerly used.

The bed is in the shape of a "T". The carriage operates at right angles to the centerline of the lathe . . . offers unparalleled efficiency with centrally located apron controls.

You, like other manufacturers in many industries, may see profit possibilities in a Lodge & Shipley T Lathe. With priority preference, you may get early delivery out of a pool order.

Write for detailed literature.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

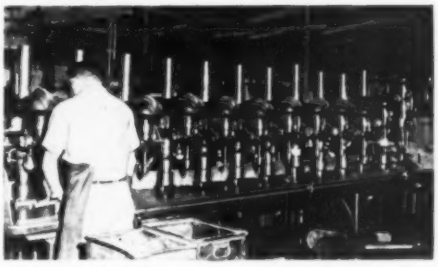
3 Simple "Moves" Show How VERSATILE DELTA TOOLS Solve Production Problems...

1 MOVE THE OPERATOR

To make it easy for the operators of a long-table multiple spindle Delta drill press to move from one work station to another, Albertson and Company, Sioux City, Iowa, devised roller seats that travel on rails. When one man completes his series of operations he passes the work to the next man. Operators can travel the full length of the table with a minimum of fatigue.

2 MOVE THE TOOL

To make easier work of drilling holes in a large, extremely heavy bath-tub casting, Racine Pattern Works, Racine, Wisconsin, mounted a Delta 17-inch drill press on a three-legged spider base, in place of the regular base. Now the casting remains stationary, and it is an easy, simple operation to slide the drill press into several positions for drilling holes in the flange of the casting.



3 MOVE THE WORK

To speed up eleven operations on an aluminum grid casting—including drilling, reaming, counterboring, countersinking—Sangamo Electric Co., Springfield, Ill., uses a Delta 15-foot sectional table and eleven Delta 17-inch drill presses for the individual operations. The casting moves from one machine to the next; and a great deal of costly trucking and handling is eliminated.

These applications are typical of the cost-cutting set-ups devised by Delta users; and illustrate the extraordinary adaptability of Delta tools to unusual production needs.

There's a Delta Power Tool for Your Job – WOOD OR METAL WORKING

53 MACHINES—246 MODELS—MORE THAN 1300 ACCESSORIES

Your Delta dealer is listed in your Classified Phone Directory under "Tools"

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"It happens every time they nab Dinsmore. The guy has a grip like a JACOBS CHUCK!"

IF IT'S A
JACOBS
IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Up or Down

Several readers have raised the question as to whether thread grinding should be performed by climb (down) cutting or conventional (up) cutting, and whether either practice offers any specific advantage.

That was a tough one for us to answer, so we turned the problem over to an expert in the field, and publish his reply below.—Ed.

Either climb cut or up cut may be used in grinding threads. In fact, on many operations, one type is used on one direction of traverse and the other on the return. It is frequently possible to so arrange the work cycle that the desired cut is used on the finishing pass.

Either method can give good results, and the advantage of one over the other depends more upon other conditions, such as number of effective cutting grains, wheel hardness, and rate of work speed, than on the direction of cut.

In general, with a slow work speed, the climb cut gives a better grain/work approach angle, less sliding over the work, less heat, and a better "ground" finish.

The up cut method works better with a relatively fast work speed, as this tends to eliminate a long, sliding approach to maximum grain depth of cut.

Sufficient attention has not been given in the past to the exact geometry of the grain path, and this is at least a contributing factor to the desired results obtained and the diversity of opinion on this subject.

Carl Soderlund
Springfield, Vt.

Mystery Thread

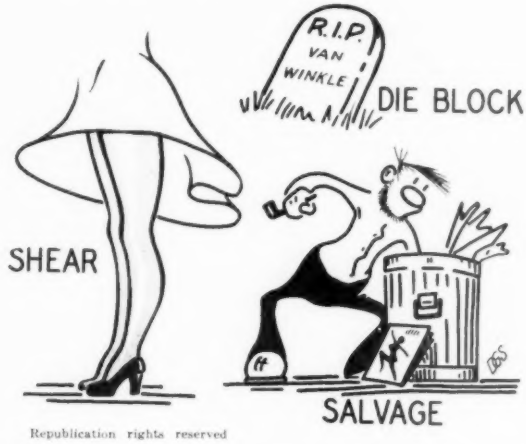
I would like to know whether you, or anybody you may know, ever heard of a Wilcox thread, 5-pitch, used in Canada. We are making a product on which that thread has been specified, and I would like to obtain detailed information as to its specification.

F.G.
Philadelphia

We have checked with American Standards Association and find that the Wilcox thread is not listed in the Canadian register of standard threads. Because of the name, we

GRINETICS

BY D. G. SMITH



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PRESSING ...

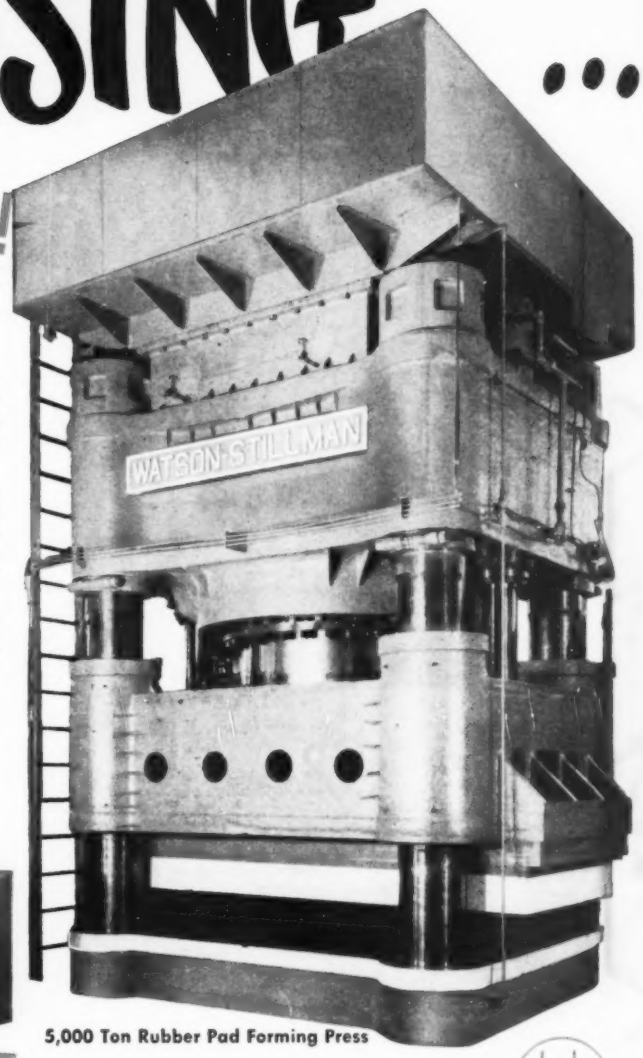
out the ARMS for UNCLE SAM!

Planes . . . tanks . . . guns . . . shells . . . shell cases or any one of a thousand and one other items that must be produced, as long as it can be pressed out of metal, there's a W-S Press to do the job . . . and more economically, too.

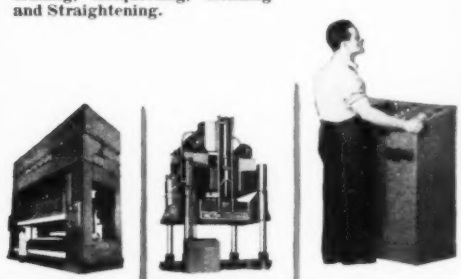
W-S Medium and Deep Draw Presses do things faster. Rejects are virtually eliminated . . . present dies and materials can be used . . . one or more draws may be cut from a progressive operation, thereby saving man hours on the job . . . intermediate annealing is often reduced or eliminated and total production time cut down.

Designed for precision work and built for long service, these W-S Hydraulic Presses offer further advantages in set-up, maintenance and tool life. Available in a large choice of pumping units and controls. It will pay you to investigate their flexibility.

Other W-S Metal Working Presses include those for Forming, Flanging, Trimming, Forging, Coining, Hobbing, Extruding, Briquetting, Bending and Straightening.



5,000 Ton Rubber Pad Forming Press



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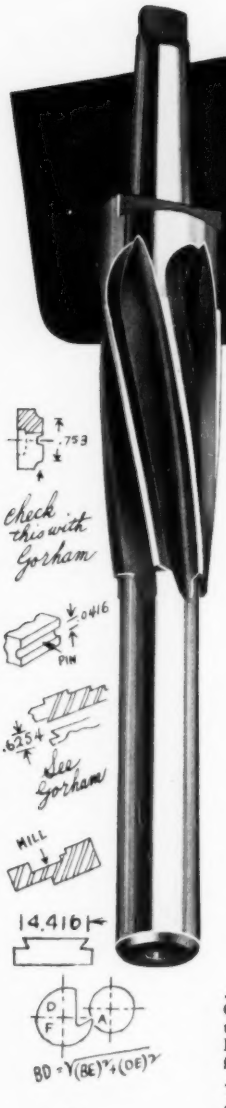


Turn problems into *profits*

with GORHAM-Engineered Special Cutting Tools

For fast, practical solutions to tough tooling problems, call in the expert . . . your nearby Gorham Field Engineer! He provides a complete engineering service to determine your exact tooling requirements. For instance:

•

He starts with your product, sketch or idea.

•

He surveys your production operations and your available equipment.

•

He considers work material properties and desired finishes and tolerances.

•

He plots proper machine feed, speed and method of tool driving.

•

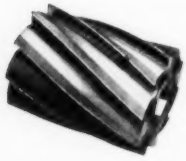
then . . . he develops practical design and engineering specifications for a special cutting tool, metallurgically "tailor-made" for your application.

•

. . . *and* his recommendations are backed by Gorham's unmatched facilities! These include three fully-equipped manufacturing plants, large Engineering and Metallurgical staffs, and the finest heat treating equipment.

These resources, plus Gorham's more than thirty years' reputation for producing the finest cutting tools, are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?*

If you haven't met your nearby Gorham field Engineer, write for his name, or send details of your problem direct for recommendations.



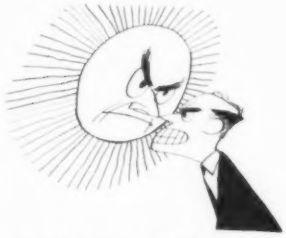
Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14408 WOODROW WILSON • DETROIT 3, MICHIGAN

called Babcock & Wilcox, but the thread is not one with which they are familiar. We also checked with Wilcox & Gibbs Sewing Machine Co. They use what they call a Wilcox letter thread, a special fine pitch of their own design, used on sewing machines and classified A to Z. We do not believe that these satisfy the coarse pitch you require, and would suggest you contact the original designer and get the information from him.

Does any A.M. reader have any information on a thread of this name?—Ed.



What's Wrong with California?

No wonder our taxes are so high, and that airplanes cost a million dollars apiece. I am not unpatriotic, and I don't mind paying my share toward National Defense, but I don't see why I am called upon to pay for college educations for a bunch of young men I never heard of, just because Lockheed wants good executives.

I remember how much it costs me to send my son through college, and it wasn't Harvard, but I paid that cheerfully so he would be fitted to take and hold a good job. It seems to me that these Young Lockheed men should have gotten their education before they got their jobs, and that, if they need additional training to get better jobs and higher pay, they should pay for it themselves, not expect me to pay for it in higher-priced airplanes.

And why Harvard? What's wrong with California colleges? There may be some snob appeal in being a Harvard man, but from a practical standpoint it would seem to me that we can produce just as good businessmen here as they can in the East.

R. J. Cunningham
Los Angeles

Reader Cunningham undoubtedly has a point, but he overlooks the fact that a young man's latent executive abilities will be brought out only after he has been actually working for some time and has found his feet in industry. It is not always possible for him to take the courses in his regular college career which time

you can make money 2 ways on

Carlton

radial drills . . .

first

you make money by saving . . . because Carlton Radial Drills cost little to operate and maintain.

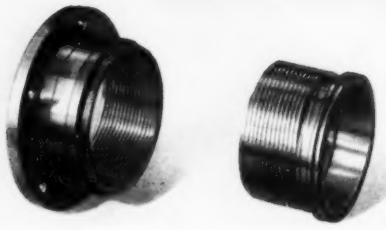
second

you make money by increasing hole production. Carlton's are designed, engineered and built to drill, ream and tap more holes per hour accurately and over a longer useful life.

yes in more ways than one, it will pay you to make your next radial drill a Carlton! Send today for descriptive bulletins.

THE CARLTON MACHINE TOOL COMPANY · CINCINNATI 25, OHIO · U.S.A.

FOCUS YOUR EYE on these THREADING FIGURES!



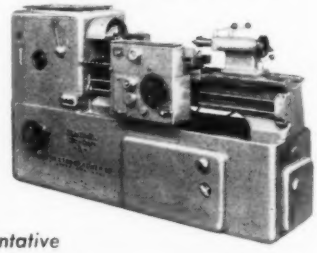
25 SECONDS PER PIECE

FOCUSING NUT & SCREW Material Aluminum — 545 RPM — 16P — Length [illegible]" — 6 Threads — Tool HSS

IT'S A "SURE SHOT"

that these high speed threading figures will start you wondering if you are losing out by not putting Cri-Dan Single Point Threading to work on your threading jobs. Tool cost averages only $3.20 . . . changeover time is only 15 minutes . . . average workers produce precision threads.

Cri-Dan Single Point Threading is obsoleting former threading methods in industry from coast to coast. Ask for Bulletin 85-A . . . it's loaded with Cri-Dan facts and figures!



Contact your Lees-Bradner representative

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

alone will indicate he should have taken.

More important, however, is the fact that, for an investment of a very few cents of Mr. Cunningham's tax bill, Lockheed is producing executives whose specialized training will soon pay off in lowered production costs that will mean lower-cost planes and hence, perhaps, lower tax bills.—Ed.

Dutch Treat

In reference to Mr. Strasser's article, "Watch Your Language For Die Components" (AM, Aug 6th, p. 105), I notice a slight difference between your standards and ours. According to our standards, the arrow indicating the heading "Punch Holder" ends too high. It should end in the plate in which the punch heads are located. A new heading should be introduced for the uppermost plate.

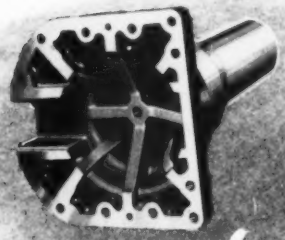
I wonder if Mr. Strasser would introduce the name "Top Plate" for it, or whether his indication holds good for the top assembly.

You might be interested in the Dutch standard translation for the same items, given below:

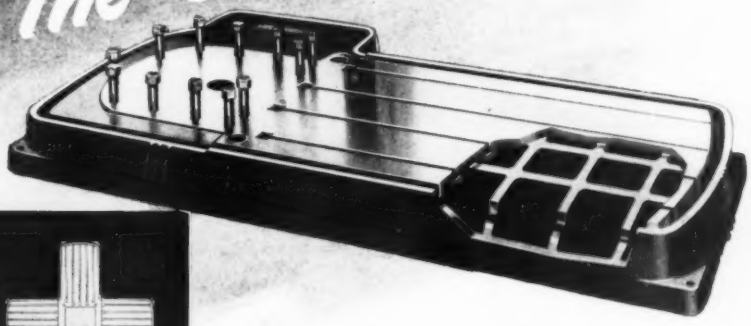
Press tool	Stempel
Punch holder	Draagplaat
Top plate	Bovenplaat
Shank	Bevestigingspen
Backing plate	Druckplaat
Piercing punch	Voorsnijder
Stripper	Leiplaat
Stock guides	Lijst
Strip	Strook
Dowel pin	Stelpen
Pilot pin	Zoeker
Stop gage	Aanslag
Die bed	Grondplaat
Die plate	Matrijsplaat or Snijplaat
Screw	Scroef
Blanking punch	Uitsnijder

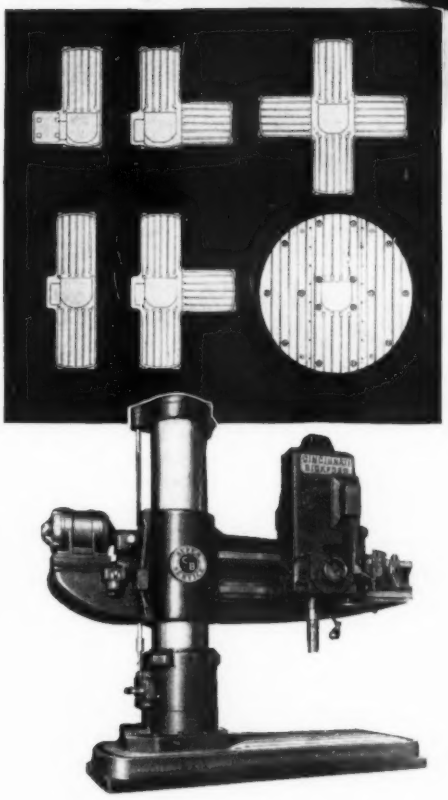
R. Kreuger
N. V. Philips Gloeilampenfabrieken
Eindhoven, Nederland

General shop practice is to refer to the top assembly as the punch holder, but it is more correct to refer to the top plate as the punch holder, and the lower plate as the retainer plate.—Ed.



From the Ground Up





In the base starts the story of accuracy—deflections here are magnified in the column and the arm, and the whole machine loses the power to do the job correctly. Today new design bases again increase the accuracy of Bickford performance.

Many years of development are behind the base of a Cincinnati Bickford Super Service Radial Drill, and the many different types of base available all have the same basic deflection-free structure.

The outstanding accuracy and performance of Cincinnati Bickford Super Service Radial Drills start from the ground up. Write for Circular R-29 for a complete description of the production features of the Cincinnati Bickford Super Service.

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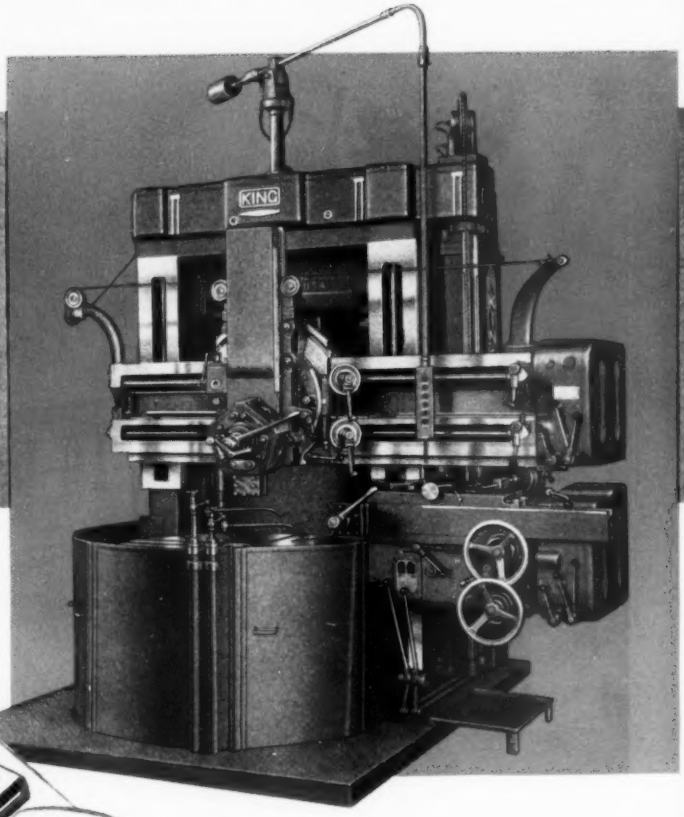
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

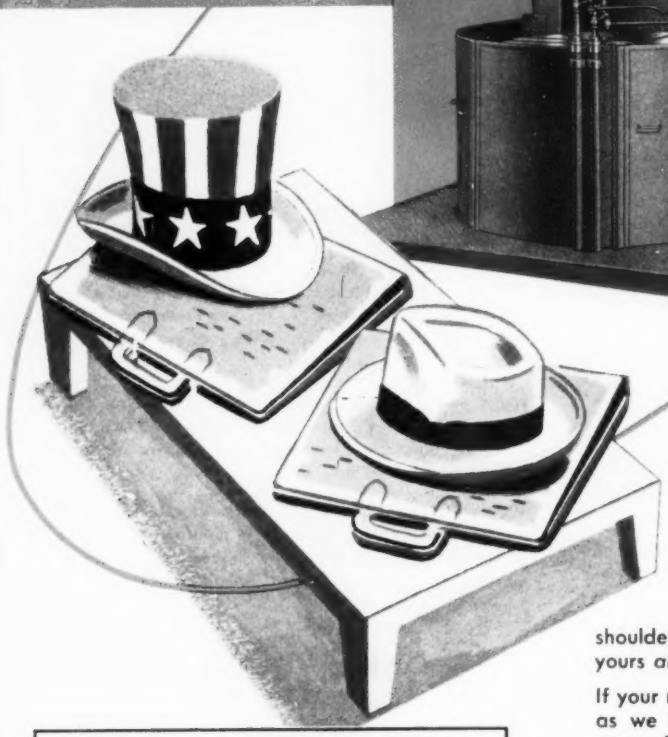
Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

TWO HATS IN OUR WAITING ROOM





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KING® Vertical Boring and Turning Machines are high on the list of essential Defense Materiel, and we're really putting our shoulder to the wheel to deliver *all* orders—yours *and* Uncle Sam's—on time.

If your new King is delayed, it's because—as we know you'll agree — Uncle Sam comes first. But you can be assured we are doing everything possible to meet delivery requirements of our regular customers, and where there is unavoidable waiting time, to cut that time right down to a minimum.

***KING** has the WIDEST RANGE in Vertical Boring & Turning Machines*

10 SIZES Single Column—30", 36", 42"; Double Column 52", 62", 72", 84", 100", 120", 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **Critical situation in jet-engine production** has resulted in calling to Washington the aircraft and automobile people to see what can be done to step up operations quickly. As final resort, automobile makers may be asked to convert some of machines now used for motor-car production to jet-engine work.

- **New fast, accurate method to test metals and plastics** to determine how long they will stand up under normal loads has been developed by two scientists of Rensselaer Polytechnic Institute. Identical specimens of a material are put under stress in a definite range, and then put through an equal number of vibration cycles so that all will be on even fatigue level. Specimens are then subjected to controlled temperatures from 20 C to 100 C. As temperatures are stepped up, each specimen changes in length in proportion to amount of stress to which it has been previously subjected.

- **New 160-hp Fire-Dome engine for 1952 DeSoto is V-8** with machined hemispherical combustion chambers very similar to Chrysler 180-hp Firepower V-8. Some 320 new machine tools, including 23 high-production transfer-type machines, and more than 12,000-sq ft of overhead conveyors in 22 lines, are being used to build the engine.

Milling non-ferrous metals at 10,800 rpm with a 6-in. carbide cutter will be possible with new machine soon to be completed by a midwest builder. Unit will have hydraulic feed of 300 ipm and special range of 1800 to 10,800 rpm. It is part of high-speed machining development program of Industrial Resources Division, Air Materiel Command. North American Aviation will get first two of these machines.

- **Dutch firm is manufacturing steel bolts and nuts** provided with SAE, USS, WW, BSF, or SI thread, from a special grade of refined steel of high tensile strength, ranging from 51-57 tons per sq in., with a yield point of at least 80% of the tensile strength and an elongation of from 14 to 20%. Use of the bolts is said to save considerable weight in making engines and other apparatus.

- **A method of applying porcelain enamel to most grades of cold rolled steel** with a one-dip operation has been developed jointly by Ferro Corp. and Republic Steel. Heart of the process is extra sharp etch made on steel in the pickling process and the uniform, complete deposition of nickel on steel when given the nickel dip. Reaction in the nickel dip is brought about by chemical reduction and is non-galvanic. Economy stems from savings in applying the ground coat, and ability to use most grades of ordinary cold rolled steel instead of higher priced or premium enameling steel.

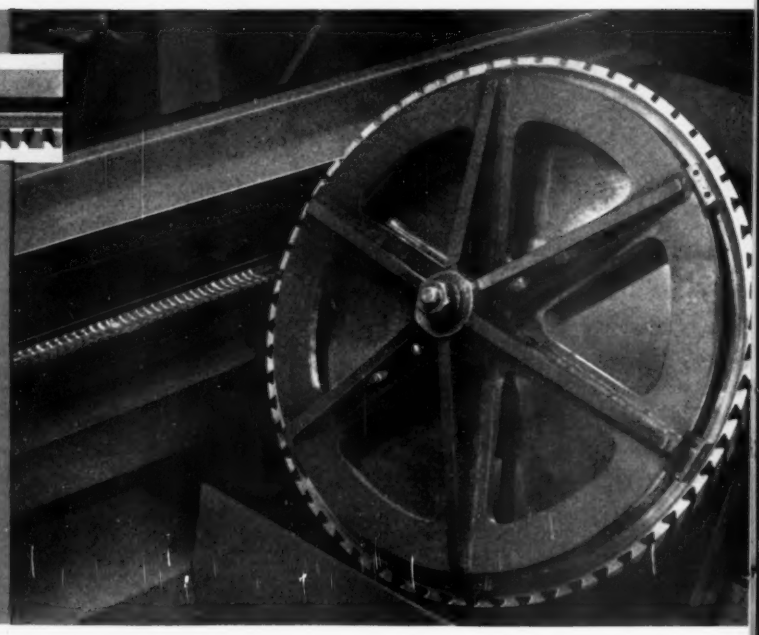
- **Final drive units for medium Army tanks will be produced** in remaining available manufacturing space in two-year-old Cleveland Chevrolet plant. It marks first time the huge plant has been fully utilized. The plant has two other contracts: for parts for the 6x6 heavy-duty military truck, and for parts and sub-assemblies for two Wright aircraft engines.

Stainless steel turbine blades soon will be forged by an "Impacter" unit developed by Chambersburg Engineering. It replaces drop-hammer and requires no special skill. Horizontally-opposed rams do the forming, and three machines in tandem complete the blade without human handling, after the blank is fed. Vibration is reported to be almost zero.

- **Boron steels are well on way to adoption on a sizable scale** by several metalworking plants. Caterpillar Tractor has used over 35,000 tons for studs, bolts, cap screws, etc. A big auto company has used 25,000 tons for axle shafts, Chicago Screw has used 20,000 tons, and International Harvester has used boron steel for gears.

- **Bearing blocks for all kinds of engines have been produced** from nylon by a Dutch firm, using an entirely new process. Previous nylon bearing blocks required a die for each size, were exceedingly costly. The new blocks can be made on a lathe to nearest hundredth of a millimeter from nylon bars. Nylon bearings are said to outlast bronze bearings four to five times, and are of comparable price.

JET ROTOR WHEELS SLOTTED BY CONTINENTAL BROACHES



ABOVE: Part of the finishing section of the Continental Broach. Shear-cutting teeth finish the bottom of the slot.

RIGHT: Previously rough-broached jet rotor wheel slots are finished on a horizontal broaching machine employing an automatic indexing fixture.

BELOW: Close-up view of the completed dovetail slots.

CONTINENTAL BROACHES TAKE HEAVY CUTS TO MINIMIZE WORK HARDENING

The heat-resistant stainless steels used in jet aircraft engines present a special machining problem because of their toughness and work-hardening tendencies. The solution is a rigid setup, ample power and properly-designed tools.

Shown here is a typical application of a Continental Broach cutting accurate, uniform dovetail slots in a jet rotor wheel. The broach is designed to take substantial cuts to minimize work hardening. These slots are cut in two operations, although some shops prefer to complete each slot in a single pass.

For the most efficient broaches to work with your broaching equipment contact your local Ex-Cell-O field engineer, or write the Continental Division of Ex-Cell-O.

CTW

51-4

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

Washington

A new civilian-vs.-military production fight has been touched off by Eisenhower's demand for more U.S. arms for Europe. Ike will get the weapons. But it will add to the pressure for further cutback of consumer goods output.

• • •

Present plan is to give Eisenhower a major share of many new weapons now coming off the production lines and recently delivered. Nothing needed for Korea would be touched. That means military stocks in the U.S. would be sharply reduced.

Military brass-hats demand increased arms output to make up the deficit. Current production isn't high enough to make it up for months, and we can't wait that long, they say.

• • •

But civilian planners disagree. They feel that production, plus stocks on hand, of most type of arms will be adequate for both European and U.S. needs. And we can make up deficits in other items quickly.

This view prevails—for the present. But the generals are still arguing. They may create enough pressure eventually to force civilian mobilizers to back down.

• • •

We can get a big, fast boost in arms output. Most arms plants are not working around the clock. Others are not operating at capacity for even a single shift.

But more weapons would chew up more metals. Additional metal would have to be taken out of production of consumer durables. New supplies of steel, aluminum will be available late next year—but that won't be in time.

• • •

Auto production would be first target of any new cut in metal for civilian goods. It's the only one where important savings could be made; seven million tons of steel, 200,000 tons of copper per year now go into cars.

But defense work would have to be found for auto production lines and workers. And the mobilizers aren't prepared to do that yet.

So Wilson will fight further cuts for civilian goods. He feels the January-March rates of metal allotments—60% of pre-Korea steel for autos, 58% for other goods—should be rock-bottom.

• • •

Steel scrap still is a major headache. First and second quarter of 1952 will be critical, despite government and industry efforts.

A Navy scrap team is surveying the reserve Maritime fleet. It will report to Maritime Administration on condition of 1200 ships, pick out those that would cost too much to refurbish. Maritime will decide how many can go for scrap.

More aluminum expansion is in the works—beyond the 54,000 tons involved in the Anaconda-Harvey deal. That would bring first-round expansion to a total of 650,000 tons a year of new capacity.

Mobilizers expect copper-to-aluminum shifts by industry will require another 100,000 tons. So look for Samuel W. Anderson, DPA's new aluminum czar, to push hard and fast for more expansion.

Even copper supply prospects are brightening—for the long-range. The government finally has contracted for an additional 30,000 tons a year to become available in two years. And other deals are brewing.

But there won't be enough copper for military needs, alone, for as far ahead as anyone can see. That's why everyone is betting on aluminum as a substitute wherever possible.

• • •

You can apply for tax relief on completed or partially completed plant and equipment until Jan. 1. DPA has postponed the cut-off date, originally set for Nov. 1. The application doesn't have to be in detail, if you can't provide all the data required on the application form. But you must contact DPA.

• • •

A number of regulations on salary controls—decided before chairman Allen resigned—are just coming out of the Salary Stabilization Board.

Approval of stock option and stock purchase plans—where the employee pays at least 95% of the market value—is one of them. Getting stock at 5% below market price is not considered compensation.

Obtaining stock at less than 95% of market value, however, amounts to a salary increase. The amount of increase is measured by the difference between what the employee pays and 95% of the market value. This amount is charged against what the employee may be entitled to under the 10% "catch-up" formula or the 6% merit increase fund.

• • •

You can now compensate your foremen and similar supervisors for extra hours in a regularly extended workweek. This restores some of the differential that previously existed between them and production workers they supervise.

A coming regulation will permit you to raise salaries—without respect to hours—to give your supervisory personnel increases similar to those production workers get under the Wage Board's cost of living formula. It will not be "cost of living," as such. It will be called "maintenance of ratio."

New Tool Microhones

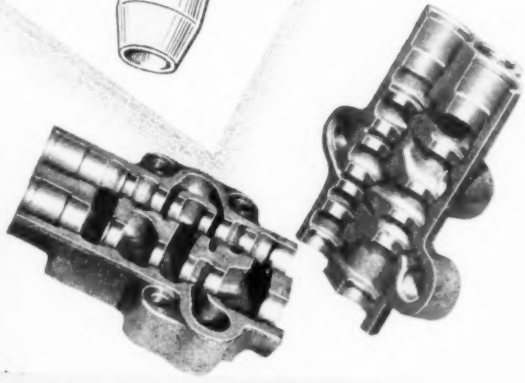
INTERRUPTED BORES

to precise tolerances

Plastic guides stabilize tool as abrasives cross keyways, undercuts, ports, reliefs, or cross holes.

The guides are forced out radially against the surface by the same cone (wedge) that applies pressure to the abrasives. The plastic wears down with the abrasive and keeps the abrasive generating a true cylinder without injurious over-cutting or breaking the edges of the interruptions in the surfaces.

Lands in cast iron hydraulic control panel held to .0002" for size, roundness, straightness and alignment. No lapping or selective fitting of spools is necessary. Holds 750 lbs. pressure without leakage or binding.



Write for issue of Cross Hatch describing MICROHONING of Interrupted Surfaces.

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Detroit

How about 1953 auto models? There'll be some, despite the closeout order on machine tools for automotive use after January. But the big changes that were once in store for 1953's seem on the back burner now, unless things change—that new Ford V-8 engine, for instance, the new Buick engine, the new Dodge engine, other major retooling jobs.

Instead, for 1953 models—still a year away, of course—you'll hear a plethora of talk about fancy new grilles, new design lines, new upholsteries, suchlike. Technically they'll be new models. Actually they'll be grade A-facelifts.

• • •

Take-home pay is dwindling in autos. Third shifts have been all but eliminated; second shifts have been reduced. And first shifts, though generally still working 40-hour weeks, are suffering some random reductions, either in one chunk during changeovers, else bit by bit. It's no longer materials; it's quota limitations.

Quotas for individual car makers in the first 1952 quarter are just as they were in the final 1951 quarter. Production total: 1,003,000 cars.

• • •

For the second quarter there's a merry dogfight going on. Willys has come into the quota picture, and Nash and Studebaker have been increased for special situation kind of reasons. Their percentage increases come out of the hides of others, notably the Big Three.

The Big Three are howling like anyone does who's losing part of his hide. Not so much that smaller firms are getting pieces—more at the fact that each of them feels it's been shortchanged in relation to the other two. The fact that the total—not yet confirmed—will be less than in the first quarter hasn't helped matters, either.

• • •

Buying policy among Detroit purchasing agents is showing a very subtle change. On an average basis, commitments are just about as far out as they have been. However, buying of steel may not be quite as far forward as it has been—while other commodities are being bought somewhat farther out.

Why the shift on steel? The feeling is increasing, steadily, that balance points in steel availability are not too far off. One dramatic proof: Tonnage of conversion steel has shriveled up abnormally in the past month or two. You can talk with some big timers who feel positively that steel salesmen will be out with tonnage to spare, looking for customers, before spring.

Here's what seems to have happened: During the past year or so, there were product switches galore. There was also widespread uncertainty. Steel was bought hungrily. Inventories built up substantially—and unevenly.

Now the pipelines of those inventories and end-users have been fairly well filled. Also, automotive output (with its big appetite for sheets and bars) has been cut back. Consequently, even the low supply spots are about at normal now. And the high spots look overly high.

• • •

That Wage Board decision not to monkey around with tool and die wages, not to create a tool-die pay code, had repercussions in Detroit. Some 600 craftsmen, members of CIO's Auto Workers, protested, demanded WSB reconsideration.

Significantly, they did not talk strike. But there were definite rumblings in the shops, especially the larger captive shops. Ford had two tool-die walkouts, one ostensibly because the shop was too cold (it wasn't), the second after leaders of the first were reprimanded.

• • •

Italian design is having a new Renaissance. When Chrysler wanted to build a super-dooper new model it went to Carrizeria Ghia, at Turin, to have its K-310 plaster scale model translated into a full-scale prototype. When Nash decided to make a splash with its 1952 models it hired Pinin Farina, eminent Italian designer, to style the cars (they'll be out next spring).

Italian lines will continue to influence American design trends. But don't expect the Italian shops to start making many bodies. The prime reason for that Ghia assignment may well have been to keep the whole development secret.

• • •

Incidentally, there's a second Chrysler K-310 model coming out of Ghia—a convertible.

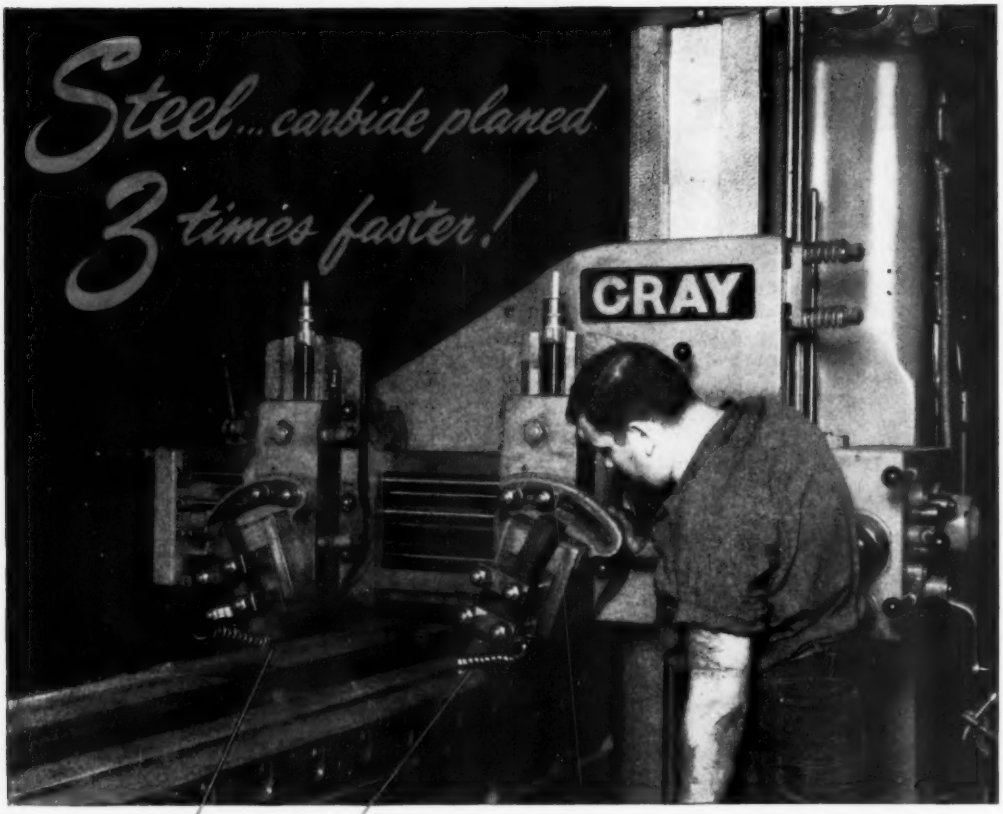
After that Chrysler might build a few for luxury market sale, with its new 310-hp engine. Ghia would build them in the "few" category. More than that would mean a transplant to America.

That 310-hp engine is basically the 180-hp FirePower unit, now powering top Chrysler. To enlarge its horsepower it's had everything done to it that a hot-rodder would do. It was that simple. And it feeds on premium gas from the corner pump—something Chrysler emphasizes, to place its offering in more favorable position with GM's Le Sabre and its 300-hp engine fed with blends of two near-laboratory fuels.

• • •

Work at the Ford Motor Co. new scientific laboratory will deal with problems of transportation, but will not be confined to the automotive field.

Within the laboratory, the following classifications have been set up: Physics—thermodynamics, high pressure and high speeds; Mechanics—physical embodiments; Chemistry—fuels and lubricants; Metallurgy—high temperature materials; and Electronics.



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Former planing time of steel bars and gibs was cut to ⅓ when this high speed GRAY PLANER CUB was put into action at a leading Midwestern metal fabricating plant.

This is accomplished by the Cub's high speed, greater power and tremendous rigidity—all essential to heavy duty carbide steel planing.

Proof of outstanding performance is the fact that this company has two more Cubs on order. Built in 24" — 30" — 36" sizes. Write for Bulletin 55.

● the job: **planing hi-carbon, hi-chrome steel bars**

cut speed 160' per min. • return speed 300' per min. • two heads • depth of cut 3/32" • feed .040

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planer type milling machines
horizontal boring machines

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Machine Tools

Amendment of NPA's M-41, clamping down on shipments of unrated machine tool orders after next Feb. 1, has been main cause of concern by machine tool builders. (See story p 172.)

Some will be caught with partly-finished machines, especially for the automotive industry. Others will have sizable amounts of components and materials which must be pushed aside. Still others have invested substantial engineering time and expense in programs, which now cannot be released to the shop.

• • •

But Washington is largely unsympathetic. Officials feel that builders knew that eventually unrated orders would be outlawed.

The fact is that the revised M-41 should take the industry "off the hook" with automobile people who have been pressing them hard for delivery of machines for new auto engine lines.

The new M-41 has further benefits. It will push customers into getting ratings for machines which now are unrated. And many of the current unrated orders qualify for DO's.

It permits an easing of ratings on machines for foreign delivery. It is thought that orders for ECA countries for essential civilian projects now will be rated. Washington lately has turned thumbs down on this business.

Builders have not overlooked one important point in the new ruling: they may accept and ship against pool orders, though such shipments may be unrated.

• • •

With Washington putting on the heat to double production, machine tool companies are scouring the country for more subcontractors.

One builder states that twice it has been on the verge of closing with a subcontractor, when one of the armed services came in and offered the subcontractor a lucrative prime contract for munitions.

October figures are expected to show a sharp gain in machine tool shipments. New orders too will be on the rising side, as will cancellations. The backlog will be piled even higher when final figures are in.

• • •

Defense mobilizers have obligated about $1.8 billion of U.S. Treasury funds, of which $536.8 million is for machine-tool pool contracts.

Under new provision of Defense Production Act, the charge against the total credit fund is only "the probable ultimate net cost to the government."

Cost of the pool-contract program will be only $1,074,000, or two-tenths of one percent of the gross volume. This estimate is based on experience during World War II's pool program.

The Air Force and NPA are taking a close look at the $210 million forging press program. Air Materiel Command's Industrial Resources Division is conducting a survey under Col. K. D. Metzger and Lt.-Col. William F. Adams.

Various industry committees and Aircraft Industries Association are cooperating with AMC in this survey. At same time, Ralph C. Gilpatrick has taken charge of the heavy press program for NPA and is studying the project.

Technically, assembly of presses in the program has been held up until the survey is completed after Jan 1. In practice, most of the program is not beyond the blueprint stage and won't be for many months.

The 50,000-ton and 35,000-ton presses for Wyman-Gordon and the 12,000-ton extrusion presses for Curtiss-Wright and Alcoa are not affected by this action.

Joint industry meeting of press builders and users is scheduled for Dec. 4-5 in Los Angeles. This is result of heavy press program survey. Large light-metal alloy forging operations will be main topic of discussion.

• • •

Japan's machine tool industry has received inquiries totaling $17 million from this country. Barclay & Co., Seattle, expects to import 150 Jap-built automatic screw machines valued at $750,000 from Tsugami Mfg. Co. and is inquiring for about 1000 grinders, milling machines and other machine tools. Deliveries will be prior to end of next year.

Other Japanese companies involved, in addition to Tsugami, are: Ikegai Iron Works; Niigata Engineering Co.; Shin Nippon Engineering Co.; West Japan Heavy Industry Co.; and Japan Machinery Export Co.

• • •

S. W. Rawson, director-general of machine tools for Great Britain (and managing director of John Brown in private life) and James Blackshaw, his right-hand man, are in Washington for the meeting of people from the ECA's Paris Office of Special Representatives.

This meeting, with U.S. officials, is to consider speeding up delivery from this country of some 3000 machines critical to the defense production programs of European nations.

If a special priority position is given these machines, over and above their present ratings, it will be necessary to take some machines from the 70% category alloted to our own armed services.

The United Kingdom, Netherlands, Norway, Denmark and France are included in this program. The Washington meeting is an aftermath of a meeting held in Paris to decide what European armament projects should have top priority.

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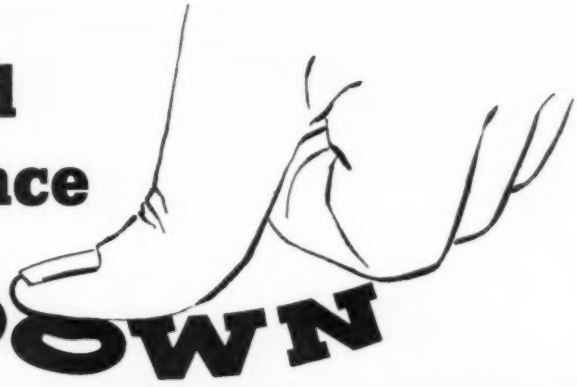

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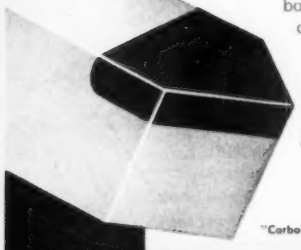

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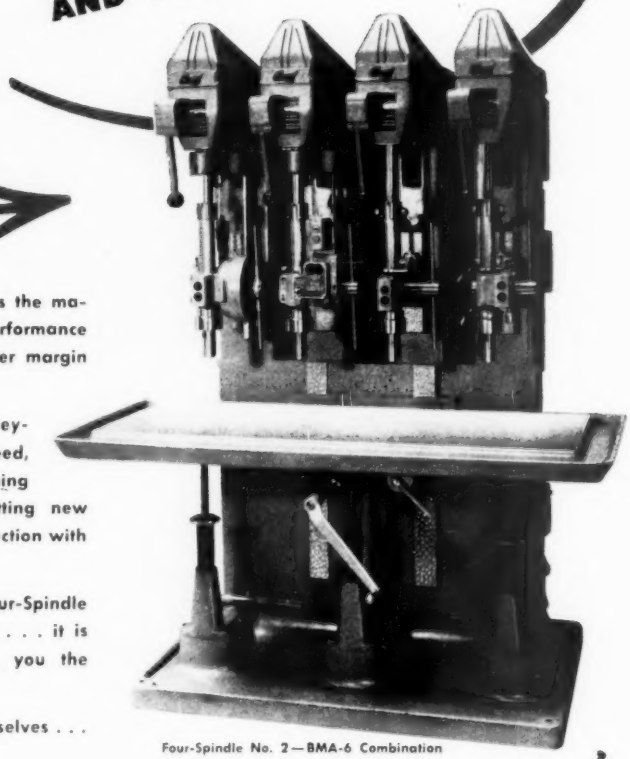

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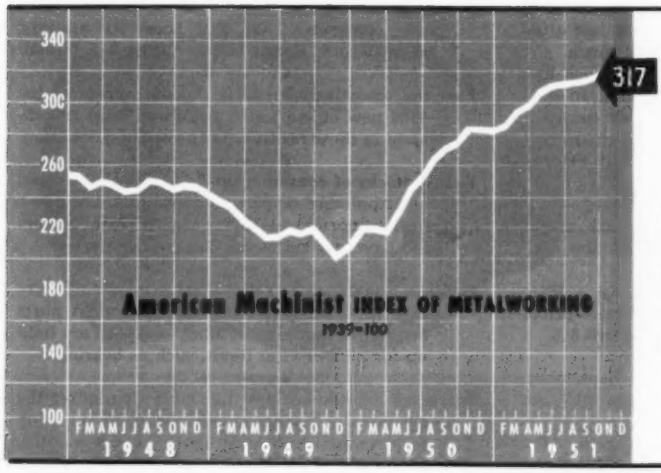
Gaging Metalworking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300
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American Machinist INDEX OF METALWORKING
1939=100
F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D
1948
1949
1950
1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV '51	OCT '51(p)	SEPT '51(r)	OCT '50
	317*	314	313	285
Machinery		306	302	261
Electrical Manufacturing		351	345	333
Automobiles, Trucks		219	224	264
Transportation Equipment		440	427	273
Other Metalworking		308	308	308

* Estimated (p) Preliminary (r) Revised

Metalworking Production Will Continue Climb

Further upswing in metalworking production is in the cards. It should continue the remainder of this year and through the first and second quarters of 1952.

American Machinist's Index is estimated at 317 for November (1939-100). That is a gain of 3 points over October, which in turn was slightly above September.

Industrial machinery and the aircraft industries are largely responsible for Metalworking's upsurge. The index component for aircraft is at 440, as against 273 a year ago.

• • •

A good sign—the steel warehouse people are feeling better. And remember that they have taken quite a beating lately.

Warehouses are getting close to tonnage of previous years. Dislocations are few. More steel to these jobbers means that government agencies are aware that defense orders are reaching down to the small-manufacturing level.

Some steel items are coming through to warehouses in greater quantities than anticipated.

• • •

Drying up and cancellation of steel conversion deals can be traced to two factors.

First, 100% steel mill operation provides more steel than Washington has figured. Second, many users find their inventories at or near the 45-day allowable limit.

Demand for foreign steel has faded too, except among steel-distressed companies along Atlantic coast. There is hardly any gray or black market to speak of.

• • •

Stamping plants are feeling the cuts in steel for consumer durable goods. At least 12 small companies in the Cleveland area, for instance, have shut down.

Volume has shrunk 10% since June in the stamping industry as a whole. It probably will go down another 10% by the middle of '52.

Medium and large stamping companies are faring better than the small ones. They have funds and backing to land war contracts on their own.

Trouble is that there just aren't enough defense stampings to go round. Materials have ceased to be a problem. Stampers don't need more than they can get under present conditions.

• • •

Screw machine products people have had a slump similar to stampers. New orders are off almost one-half from last April's peak, and shipments are down one-fourth. The dip will continue well into next year.

Reason: new orders ran far ahead of shipments for 16 straight months prior to last June. That was longest period of that kind since 1923.

Failure of prime contractors to specify sufficient information—inspection methods, surface finish, etc.—is causing confusion among screw machine product makers.

Gaging Business

Many forces are at work to bring on a new inflation movement. It will not be as rapid as just after Korea. And prices will not rise so much.

But there is likely to be a steady gradual push upwards. These are the factors leading in that direction: (1) easing of some price controls; (2) new rounds of wage increases; (3) continued curtailment of civilian goods; (4) increased output of military items.

• • •

Gross national product is now at an annual rate of $335 billion. That is higher than in the final quarter of last year.

Industrial production, in general, is only a little more than 2% ahead of 1950. Wholesale prices are up less than 2%, retail prices about 6%.

• • •

Manufacturers' shipments declined in September, latest figures show. And backlogs did not grow for the first time in two years.

Inventories held by manufacturers went up $400 million. But it was the smallest gain in months.

Most of the increase was in the heavy durable goods industries, mainly in aircraft.

• • •

October employment, at 61.8 million, was about the same as in September. Factory employment actually dropped a bit. Nevertheless, total workers were 1 million more than a year ago. It was the biggest October in history.

• • •

New construction should be above $29 billion for the entire year 1951. That would be $1 billion more than last year. Total in first 10 months got up to $25 billion.

Public spending for housing, defense plants and military facilities is responsible for the gain.

Freight car assemblies have topped the 10,000-a-month goal. But this level will not hold long.

Automobile industry is due to get $8 billion of new war contracts. That will boost its military awards since Korea to more than $15 billion.

• • •

Fast tax amortization has now been approved for 4384 new or expanded facilities. Total investment in these facilities is upward of $10 billion.

• • •

Excess stocks of consumer goods have been worked off. Appliance dealers, for example, are down to their normal 30-60 day supply. Auto dealers too have got rid of top-heavy inventories.

• • •

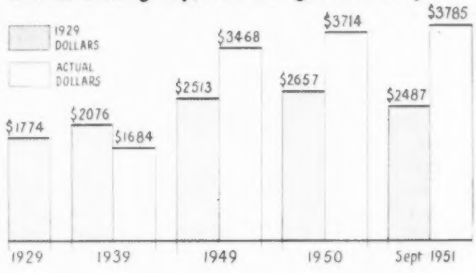
Defense production is going up slowly, with shortages of tools, materials and component parts hampering assemblies. Many weapons are held up for lack of vital items, such as bearings.

• • •

Increased defense business has more than offset the cutbacks in civilian-goods orders in the drop forge industry. Current backlog is 5-6 months. Defense and defense-related orders make up about 60% of all business.

Shops are getting enough steel. But there is much grousing about quality and sizes.

Annual Earnings Up, Purchasing Power Drops



WEEKLY BUSINESS INDICATORS

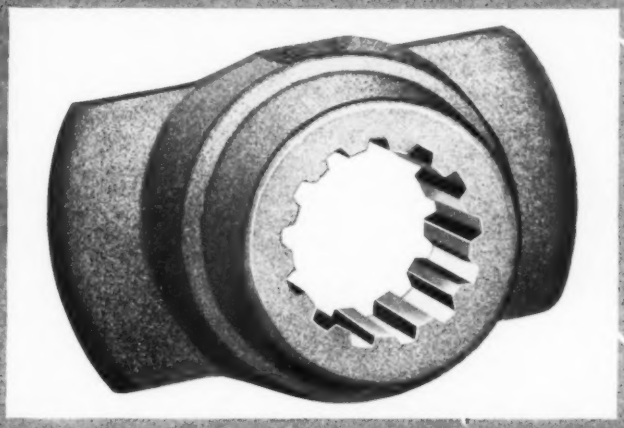
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	230.7	233.1	219.1
Steel ingot operation (thousands of tons)	2,021	2,019	1,981
Electric power output (million Killowatt hours)	7,396	7,319	6,574
Production of automobiles and trucks	120,483	118,743	161,009
Engineering construction awards (*Engineering News-Record*, millions)	$313.0	$159.5	$214.9

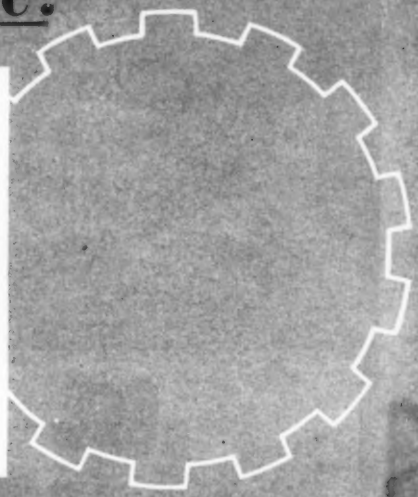
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	219	217	211
Index of durable manufactures production (1935-1939 = 100)*	273	268	251
Durable goods manufacturers' sales, millions*	$ 9,991	$ 9,741	$ 9,902
Electrical machinery manufacturers' sales, millions*	$ 977	$ 870	$ 1,052
Other machinery manufacturers' sales, millions*	$ 1,765	$ 1,708	$ 1,123
Durable goods manufacturers' new orders, millions	$10,692	$10,469	$14,305
Electrical machinery manufacturers' new orders, millions	$ 940	$ 1,284	$ 1,420
Electrical machinery manufacturers' new orders, millions	$ 2,088	$ 2,259	$ 2,293

* Seasonally adjusted.

Lower Cost-per-piece:





BROACH REDESIGN *cuts tool costs—boosts life*

SAVES *$450.00* MONTHLY

Redesign of the tools for this spline broaching operation resulted in a 24% reduction in original tool cost, 22% increase in the number of sharpenings per tool as well as a 14% increase in the parts produced per sharpening. The result in terms of cost-per-piece was a net saving of $450.00 per month.

Slight savings in production and sharpening time were effected due to the fact that this redesigned tool was shorter than the original. However, in many cases lowest cost per piece can be achieved only through redesign which increases tool length . . . a decision which is best made for each application by qualified broach specialists.

This spline operation is but one typical example of how Detroit Broach specialization in broaches and broaching tools pays off. Such specialization provides a back-log of experience which is unparalleled as the basis for sound recommendations. Whether you are considering conversion to broaching or more for your money on present broaching operations, don't fail to consult Detroit Broach. We will be very happy to supply actual cost and production data.

DETROIT BROACH CAN CUT YOUR COST-PER-PIECE *by*

1 Developing broaching set-ups to replace other, more costly machining methods.

2 Redesign present broaches and broaching set-ups to make them more efficient.

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DETROIT BROACH COMPANY

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MORRIS SAVINGS IN DETROIT...
show up in Anytown U.S.A.

On the six-station Morris High Production Machine shown here, 11 holes are drilled in this camshaft at a rate of 89 pieces per hour at 80% efficiency.

OPERATIONAL SEQUENCE

Station 1—Load and unload
2—Drill two 3/16" hole part way
Drill one 3/16" hole to depth
3—Drill two 3/16" holes through
4—Drill one ¼" hole through
5—Drill two 3/16" holes part way
Drill one 3/16" hole to depth
6—Drill two 3/16" holes through

TOTAL . . . 11 operations

There probably isn't a popular make automobile that doesn't have several of its parts mass-produced for less on a MORRIS High Speed Production Machine. And the savings . . . in Detroit, Flint, Lansing or other auto centers . . . finally show up where they count most, in the delivered price of your car in ANYTOWN, U.S.A.

If you have a multiple machining process involving drilling, reaming, tapping, or similar operations, consult Morris Engineers. Without cost or obligation, they may be able to suggest a solution . . . prove a MOR-SPEED unit can produce more parts —in less time—at lower cost—to highest standards.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost — with PRODUCTION plus PRECISION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How Soon the Automatic Factory?

No one doubts that the world of tomorrow will be much more mechanized than the world of today. Even the fully automatic metalworking plant is closer than many managements suspect.

Take the new Ford engine plant. It contains some 50 transfer-type machines tied together with Ford-developed automation equipment which all but does away with manual labor.

Here, in practice, is a near-approach to the automatic factory. A group of students at Harvard Business School, aided by several industrialists, have gone further, in theory.

They have come up with a report, "Making the Automatic Factory a Reality." Not content to be merely academic, they have designed an automatic piston factory and have worked out actual operating sheets for machines.

NOW YOU MAY BE THINKING that this is fine for the high-production automobile industry. But how about the job shop?

The Harvard researchers have gone to work on that problem, too. They have studied automatic production for short runs of products.

General Electric, they point out, has developed a system (called "record playback control") which enables a shop to make 10 to 20 units automatically at no more cost than if many more units were being made. There is an "if" about it, however. The shop must normally receive numerous orders for more than one unit of a product.

Even so, don't jump to the conclusion that the automatic metalworking factory is here. A great gap must be closed before that day arrives, the Harvard group reports.

That gap is primarily informational. A big educational job has to be done on metalworking manufacturers first.

"MOST MANAGEMENTS do not know what is technologically possible in automatic production," John T. Diebold, Harvard group leader, concluded, "Nor do they realize in what terms they must think in order to apply usefully this technology to their industry."

Here is a real challenge to alert managements desirous of keeping ahead of the crowd. Manpower is critical. It promises to stay critical throughout the 1950's, and perhaps longer.

Labor rates are sky-high and will go higher. More output per manhour is the only way to make those rates palatable and tolerable. And remember that the worker must not be asked to do more physically than he does now.

Automaticity, carried far beyond where it is today, is the only answer.

The Harvard group is on the right track. The automatic factory is not just a figment of one's imagination. It can be made a reality. How soon it will become a reality, however, depends on how quickly management can adjust its thinking and planning to this, as yet, revolutionary idea.

THE COMPELLING URGE to cut costs in a high-price-level economy may be the deciding factor. Perhaps before 1960 rolls around the automatic metalworking shop will be running full blast.

Burnham Finney

Write for New
Cincinnati Shear Catalog S-6i

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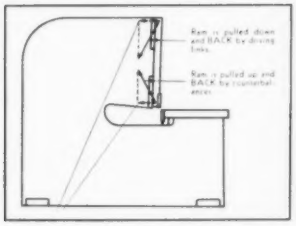
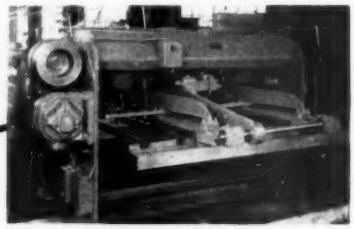
Learn about... the exclusive features illustrated below—and many others.



Cincinnati Non-Float Ram

Cincinnati Sure-Set Knife Aligner

Cincinnati Hydraulic Holddowns



Cincinnati Magnetic Sheet Support

Just off the press This up-to-the-minute, illustrated catalog will give you a complete description of the speedy, accurate All-Steel Cincinnati Shears in capacities from 12 gauge to 1¼-inch steel plate, in 4-foot to 24-foot lengths. Also, many special features for particular needs are illustrated and described.

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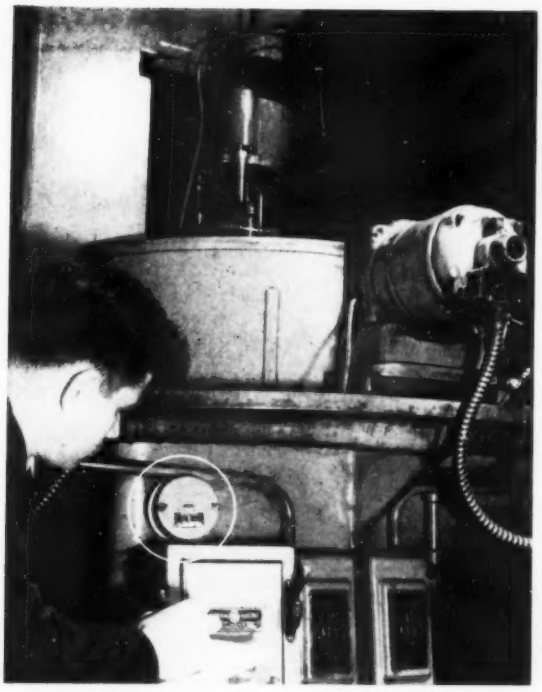


METERED TIME BOOSTS MACHINE OUTPUT

A new program at G.E.'s West Lynn plant aims at increasing production through better use of installed equipment. Instruments provide data to reduce idle time and to improve maintenance planning

BY T. D. ROWEN,
Meter and Instrument Department
GENERAL ELECTRIC CO., WEST LYNN, MASS.

Time meter measures elapsed time of machine operation for which it is installed. Time meter is shown on Kingsbury drilling and tapping machine

INDUSTRY'S major task today is to increase production. Growing defense needs must be met and an unprecedented demand for civilian goods must be supplied. Yet, existing capacity seemingly is taxed to the utmost and expansion is difficult because of manpower and equipment shortages. Under these circumstances, industry must make every effort to make the best possible use of all equipment presently on hand.

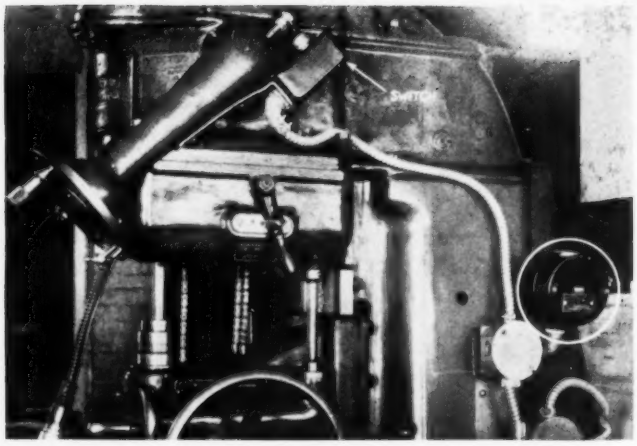
To meet this challenge, management at General Electric's West Lynn works has inaugurated a program aimed at increasing the number of productive hours that can be obtained from presently installed equipment. Basically, the new program, generally referred to as metered time, makes use of electrical and time-recording instruments to collect data that provide a measure of the actual and potential production performance of the machine. Once the facts on performance are known, action often can be taken to improve methods and boost output.

Still in its early stages, the new program shows considerable promise in three major fields: more effective utilization of the machines, better maintenance planning, and improved trouble-shooting procedures. Each of these fields represents an opportunity for management to procure extra production from machines and equipment already on hand. The procedure is logical and simple, and the instruments required are standard and relatively inexpensive.

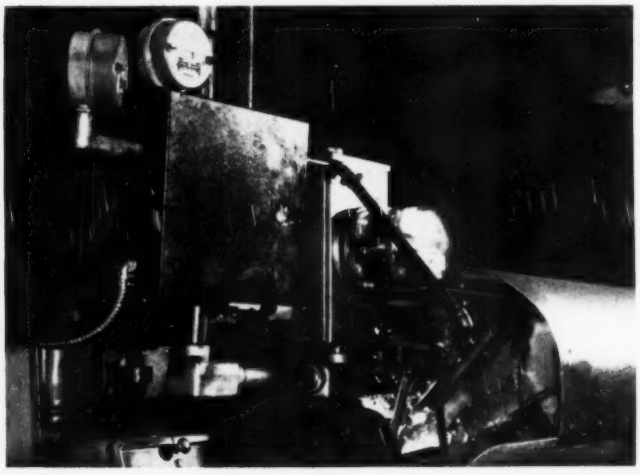
Breaks Toolroom Bottleneck

Many studies, for example, can be made with Type KT time meters, which are small, simple, elapsed-time recording devices operated by any 25-, 50-, or 60-cycle power source. A good example of the conditions brought to light by instruments of this type is a study made on a jig-borer, which at the time the study was made was bottlenecking toolroom operations. One meter was wired to show the time that the machine motor was running; the other to show the time that the clutch was engaged. Results indicated that actual boring time amounted to only 12% of the day. The remainder of the time was spent in setup. To break this bottleneck, a special setup plate was designed to permit setups to be made on the bench. They then were transferred to the machine for the actual boring operation. This boosted the effective utilization of the machine to almost 70%.

Watthour meters, recording instru-



Time meter on jig borer showed that actual time machine was working amounted to only 12% of time available. Rest of time was setup. Improved method of setup boosted utilization to nearly 70%



Two time meters and a watthour meter installed on a multi-spindle automatic screw machine. One time meter indicates clutch time, the other measures motor time

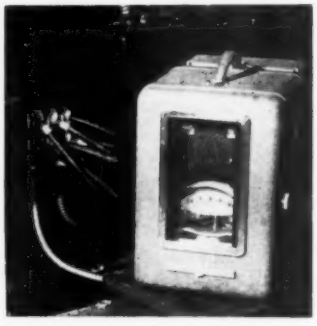
ments, combination watthour-time meters, and time analyzers also have been employed in addition to simple time meters. In any case, the first step is to measure present utilization and power consumption, as, without this information, we have no basis from which to work. The selection of instruments for making these measurements depends largely upon the complexity of the machine and its cost.

While a simple machine may require only a time meter to provide the necessary data, large complex equipment such as an overhead crane or a die-casting machine will require a time analyzer. On larger machines, watthour-meters may be installed permanently. But for spot checks of smaller machines, a portable combination watthour-time meter is satisfactory, as shown at right.

Shows Up Lost Time

Often, the results of accurate measurement prove startling. Machine utilizations estimated at 40%, 50%, and over, have shown to be near 10, 15 or 20%. Once this has been proven, the next step is to determine the reason for lost time and wasted capacity. Perhaps the answer may be read directly in the recorded results, or perhaps an additional investigation with the time analyzer or with methods men may be required. In the latter case, as more detailed and accurate information becomes available, the services of the methods man can be used much more efficiently. He becomes a data analyzer, not a data taker.

If lost time is attributable to lack of material or parts, an investigation of scheduling and handling is undertaken. If caused by long and complicated setups, simplification of method or revision of machine design is investigated. If due to restockng difficulties, new methods or changes in the form in which we receive our stock are checked. If frequent machine breakdowns occur, the maintenance system is reviewed, and a study of other makes of machines is undertaken. If wastage of power is occurring because of a machine running idle, limit switches, time-delay relays, and interval (or process) timers are installed to shut the machine off automatically when not producing. These devices must be checked to determine whether the extra pow-



Combination watthour-time meter consists of two time meters and a watthour meter for quick, simple hookup on machines. This is for spot checks and short runs on equipment

er required to start the machine, or the time lost in bringing it up to speed, overbalances the saving that is obtained while the machine is stopped. Consideration also must be given to possible changes in machine temperature because of intermittent operation.

When these changes are made, a recheck of the new setup is made with the same devices to determine if the predicted improvement is an actuality. Some of these checks may run for a long period, as the time analysis of the job itself may fail to show a marked increase in breakdown time or tool resharpening. From this recheck, an accurate calculation of savings is readily made. Furthermore, a periodic check of utilization time and power consumption quickly shows that the job is continuing to run in the prescribed manner.

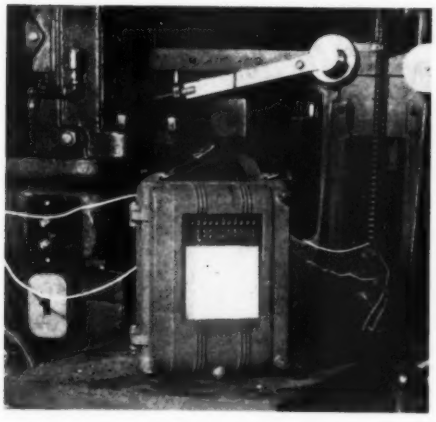
Aids Automatic Operations

A department that involves a serious utilization problem in many plants, and one in which the metered-time approach has been applied with considerable success, is the automatic screw-machine section. In this case, a combination watthour time meter was employed to give total power consumption and the total time the machines were running. A second time meter was installed to show the time during which the clutch was engaged. This gave a picture not only of the amount of idle time on the machine itself, but also of the cost of wasted power. In thinking of wasted power, it should also be remembered that the total waste is more serious than it appears, as the machines running idle lower the plant power factor.

To remedy this situation, we installed our T-48 interval timer in the machine circuit. This automatically shuts the machine down at the end of a bar of stock. In some cases, it has been desirable to set the power to shut the machine down a few pieces before the end of the bar to enable the operator to check his last piece for size, or to prevent tool breakage because of a short feed-out.

A recheck with portable watthour time-meters showed a substantial reduction in machine time and power per-piece-produced, and definitely proved the installation profitable. Furthermore, operators were able to increase their production by knowing at all times just how much stock they had in each machine by checking the elapsed time on the interval timers.

Very effective use also has been made of the time analyzer in checking complex machines such as special Kingsbury setups and die-casting machines. The time analyzer can be set up to record the relationship among twelve different elements simultaneously, and is a much more reliable and effective means of obtaining accurate job data than the more usual procedure of taking an all-day time study.



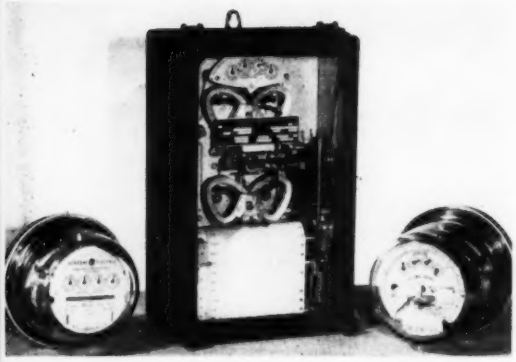
Time analyzer is a recording strip-chart instrument furnishing a permanent accurate record of duration, occurrence, and relationship of as many as 12 different elements simultaneously — such as motor running time, clutch-in time, stock-in-machine time, the relationship of working time of one machine to another, or the comparison of two or more machines of different types, each of which may be using different methods of operation

Better Maintenance Planning

Another very important application of time meters is in maintenance planning. The cost of unexpected breakdowns in production equipment is high, both as regards actual cost of repair and in terms of disruption of production schedules. Everything that can be done to improve maintenance techniques such that repair and replacement work is performed at predetermined intervals before trouble occurs, and at times that do not interfere with the regular operation of the equipment, is a big step toward getting the extra production that is so badly needed from all equipment today. Application of this concept of maintenance planning, called productive maintenance throughout the General Electric organization, involves five major phases: (1) an adequate staff of trained maintenance men, provided with (2) the tools needed to perform properly the functions of (3) regular, routine checks of operating equipment, and (4) planned outage of this equipment at regular scheduled intervals during which rebuilding and modernizing machines will be done with parts from (5) an adequate stock of mechanical and electrical spares.

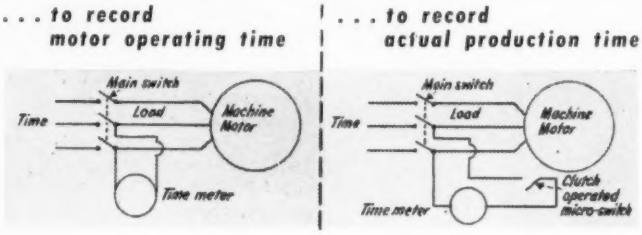
Setting Up Program

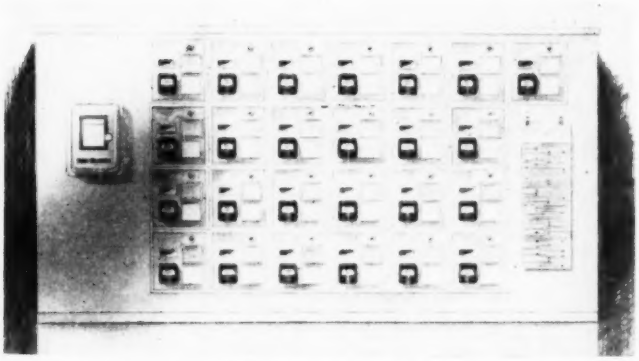
In setting up a program of this kind, KT time meters play an important role in step 4. Meters installed on productive equipment measure the hours that each machine operates, and stop automatically when the machine stops. Each time anything occurs that takes the machine out of production, the reason for the repair or adjustment, as well as the total hours the machine has run up to that time, are recorded on a maintenance form, held by the foreman. Periodically, these are collected by the manufacturing engineer and are analyzed. The objective is to determine the approximate time at which maintenance of all kinds should be performed to avoid breakdowns in service. Eventually, for each machine, a Kardex file will be set up containing a complete history of the machine, a spare-parts inventory record, the machine utilization record, and the time at which



Watthour meters are made in many types. Shown here are single-phase, recording-demand and indicating-demand types. These usually are permanent installations, and are employed only on large, complex machines

HOW TO HOOK UP TIME METERS . . .





Proposed unit supervisory aid panel for supervising several banks of machines and incorporating production counters, time meters, and a strip-chart recorder. It is to be used by maintenance, production, and manufacturing supervision

various parts must be replaced. By setting up schedules of planned outages—planned in advance for the time when the machines can be taken out of service for the shortest possible time—the stoppage will least affect total output and the operation of other related units in the plant.

Guides Machine-Tool Buying

When machine tools are readily available again, records of the type described also will play a useful role in our equipment replacement program. With the exception of replacing obsolete equipment with new machines that more fully utilize labor and for which savings are easily determined, we purchase new equipment either to replace old, worn-out machines, or to provide additional capacity. Therefore, we want to know how old the machine actually is—not in years, but in operating time; what its percentage of utilization has been; what it has cost us to maintain. In purchasing new equipment, the maintenance history and utilization record enables us to determine whether the machine has given such satisfactory service as to warrant a reorder, or whether we should seek another manufacturer. Furthermore, the record of the nature and causes of breakdowns, points out design changes that should be made to obtain more satisfactory operating service.

Time meters also can be used to check the life of tubes, electrodes for welders, special tools, test equipment, and so on, to enable us to determine scientifically whether the manufacturer's guarantees are being met and which equipment is giving the best service.

While the program still is in its formative stages, sufficient experience has been obtained to prove the worth of this method of analysis. It gives accurate data that forms the basis for improvement in plant operating procedures that will result in increased efficiency in the use of machines and equipment. It is of particular significance today when production must be boosted quickly to satisfy the mobilization and economic needs of the country.

Tips FOR TOP SHOP MEN

407 Are lines of authority clear-cut in your organization, or are they obscure and confusing? Somebody has to be boss.

408 Get as many people as possible to take a hand *before* you start a new policy or make a final decision. The more people involved, the better.

409 Before you work out a procedure, pump ideas from the minds of experienced people around you. That's one way to get group thinking and group action.

High rake and clearance angles ground on conventional 45° helix-angle slab milling cutter have increased production at Allis-Chalmers. Hardness of turbine-blade stock is 15 to 24 R_c

HIGH-RAKE CUTTER PRODS PRODUCTION

Climb-milling 403-type stainless with HSS cutters of 26° rake and 14° clearance doubles parts per grind, cuts power over 40%, at almost twice the speed and four times the feed

BY R. F. THUMA,
Assistant Superintendent, Maintenance & Tools Section
General Machinery Division
ALLIS-CHALMERS MFG. CO., MILWAUKEE

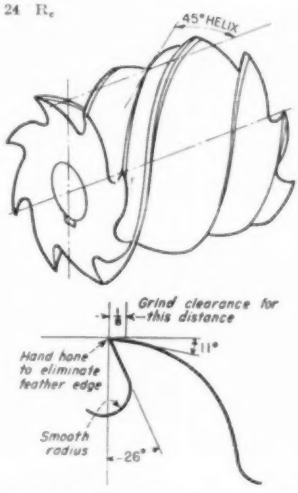
MANUFACTURE of steam turbines at Allis-Chalmers includes numerous milling operations performed on the corrosion-resistant steel (similar to 403 stainless) turbine blades. Most of these blades are machined from bar stock and require a series of operations ranging from 20 on simpler blades to 78 on more-complicated forms. The material is perfectly machinable, of course, but difficult to machine at high cutting speeds.

We experimented with special rake and clearance angles and discovered that feed rates could be increased 360% and cutting feeds 70% by making relatively minor changes in a standard 4-in.-dia, 4-in.-long, heavy-duty 18-4-1 HSS helical slab-milling cutter. It originally had 10° rake and 5° clearance. These were increased to 26° and 11°, 63-65 R_c.

After the larger angles were ground, edges were carefully hand-stoned to eliminate the feather-edge burr that results from grinding the clearance angle. We found this necessary to eliminate chipping of the cutting edge.

We were then able to increase cutting speed from 105 to 177 rpm, and to increase feed rate from 8 to 36½ ipm. Chip load per tooth was thereby increased from 0.014 to 0.0257 in., yet finish was perfectly satisfactory. A high-sulfur-base cutting oil was flooded over the cutter, and it was rotated for climb-milling.

The cutter is resharpened when a circular land of 0.003-in. has been developed by wear. The new cutter gives twice as many parts between sharpenings as a conventional tool.

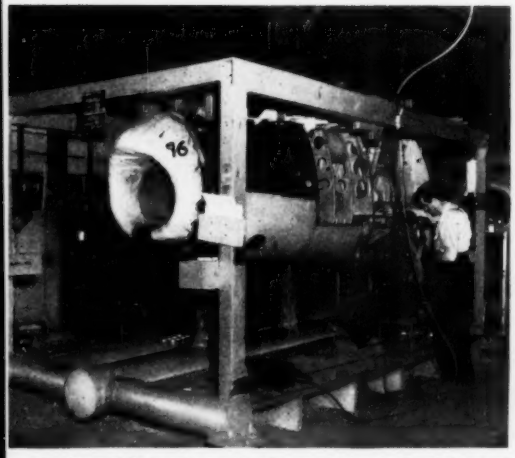


HSS slab mill requires 40% less power when milling at increased feeds and speeds. Rake angle of 26° is used instead of normal 10°. Clearance angle of 11° must be ground to cutting edge, without circular land

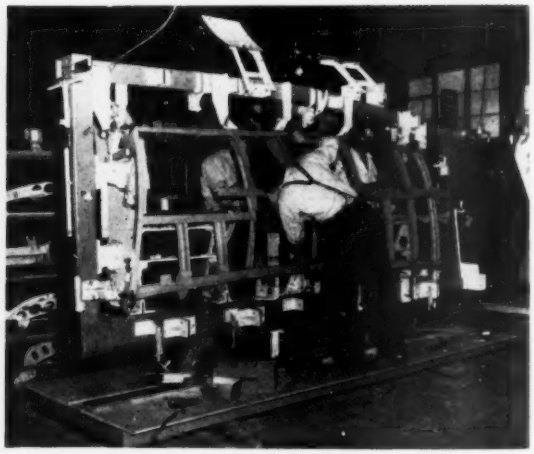
Perhaps one of the most unusual developments from these experiments was the effect on the power required. Even with the higher feeds and speeds used, the current input (amperes) to the motor was reduced approximately 40%. For actual horsepower used, the % reduction is greater.

We have *not* been able to approach this performance with standard carbide or cast non-ferrous alloy cutters, because the high helix angle required is not available. Carbide face mills have proved unsatisfactory because the cutters will not clear themselves of chips and the finish is marred. When a suitable high-helix carbide slab mill is available, even these results may be surpassed.

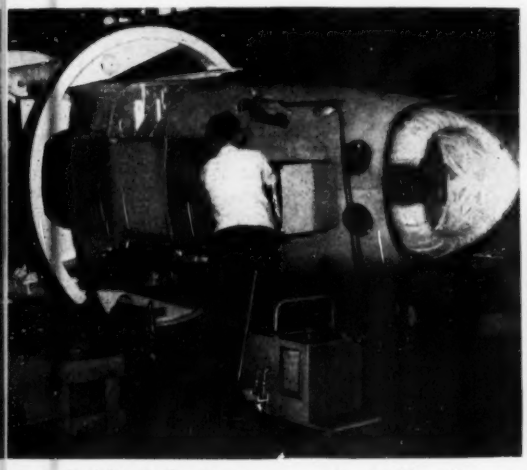
Experiments with cast non-ferrous-alloy cutters were not satisfactory as the cutting edges chipped and would not hold up. With the increased rate of stock removal, chip disposal has become a serious problem. Previously, the operator had ample time to clean the machine bed and file burrs from previously milled parts while a part was being machined. On longer lengths of stock, this still is possible, but deburring necessarily has become a secondary operation on some of the shorter lengths.



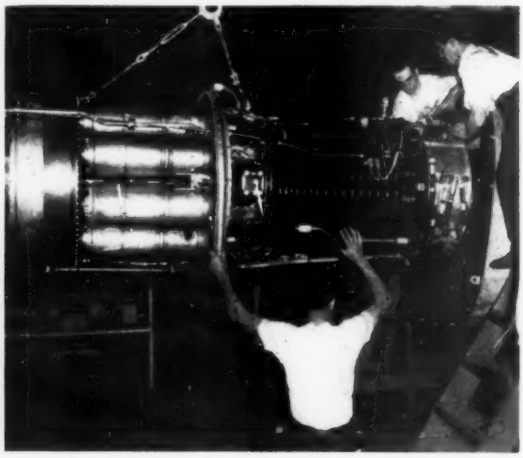
1 **Nose skin** is attached to forward section in rigid steel jig carried on jackscrews to permit accurate leveling. Note the protective wrapping on the air intake. The scoop is made of plastic-impregnated glass cloth and must not be scratched or marred in any way



2 **Intermediate side panels** are assembled on a subassembly line in Canadair's Cartierville plant which covers 1¾ million sq ft. Assembly flow lines are over two miles long. Proper planning and tooling made possible delivery of first Sabre Jets several weeks ahead of schedule



5 **Portable hydraulic pump** permits checking the operation of the nose wheel hydraulic system at assembly. A similar check is made of the main landing gear when assembled to the wings. Defects are easily remedied here, but would be difficult later

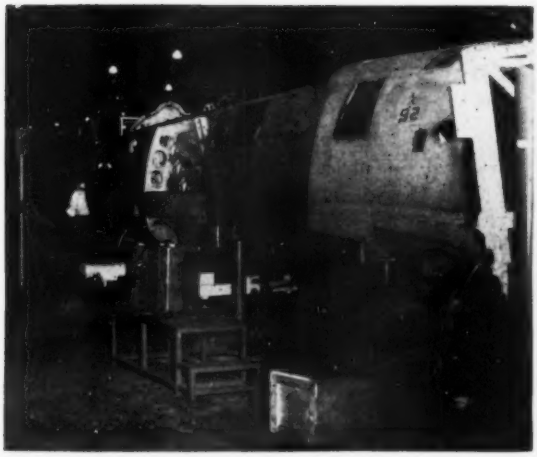


6 **Turbojet engine,** General Electric J-47, is eased into position in the front end of the fuselage. Believed to be the fastest plane now in production in the world, the Sabre holds an official speed record of 670 mph with full combat load of guns and ammunition

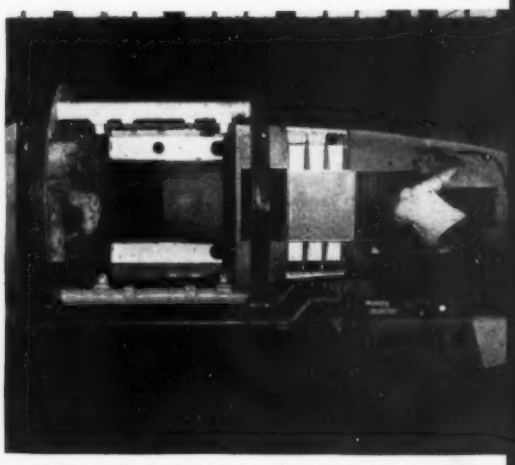
CANADA BUILDS

Under license from North American Aviation, Canadair Ltd.

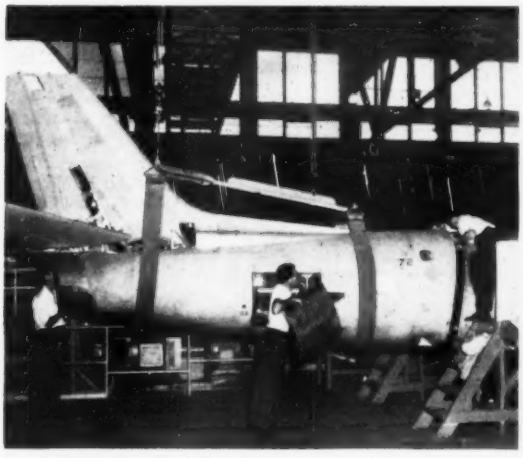
Canadian Air Force...Using its own manufacturing tech-



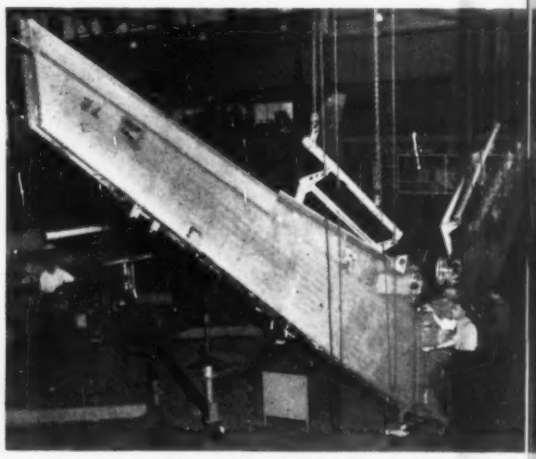
3 **Forward end** of fuselage takes shape as the intermediate section is attached on progressive assembly line. Over-all length of plane is 37 ft, height 14 ft, and gross weight 13,716 lb. Service ceiling is over 40,000 ft, and the plane has a tactical radius of 500 miles



4 **Roll-over jig** holds the entire front end of the fuselage and greatly simplifies the installation of various components. Here it is turned through 90° for installation of the nose wheel. This technique materially reduces fatigue by eliminating awkward overhead work



7 **Tail assembly** is threaded over the engine tailpipe and attached to the rear of the front fuselage assembly. More than half a million rivets, bolts, clips and other small fittings, 1733 lb of steel, and 7455 lb of aluminum alloy go into the construction of one plane. Doors near tail are dive brakes



8 **Wings and center section** are assembled into a unit, complete with main landing gear. Sweepback of 35°, slim fuselage lines, polished surfaces and high-powered jet engine combine to form a deadly weapon for combat at speeds approaching the speed of sound

THE SABRE JET

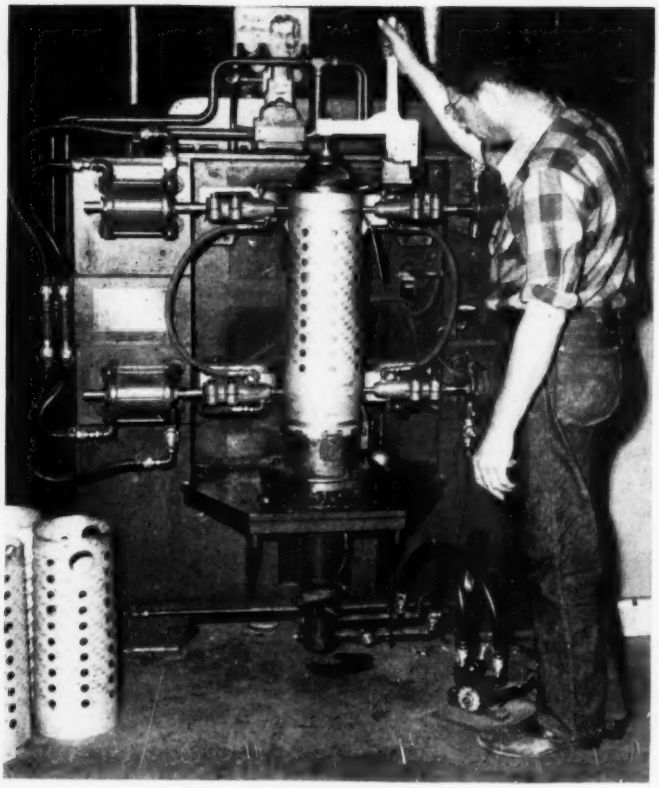
has put the F86 interceptor into production for the Royal

niques, the company has made deliveries ahead of schedule

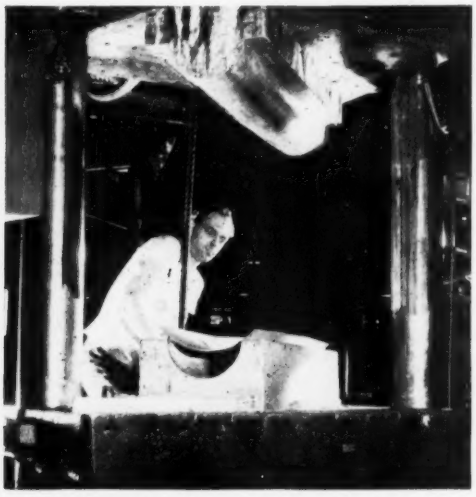
SHOP SHOTS

at

RYAN AERONAUTICAL CO.



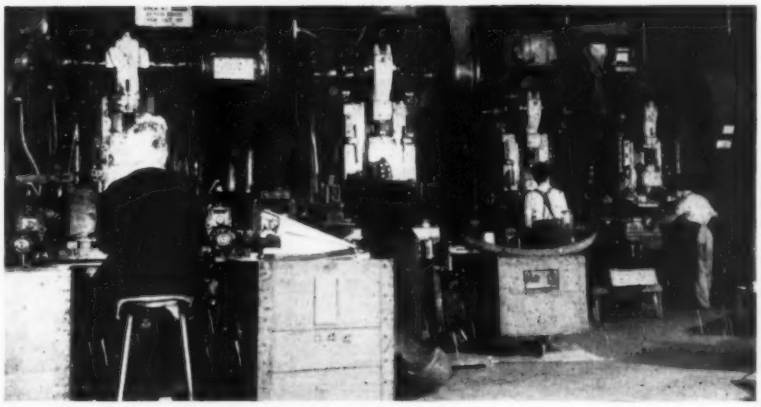
Post spot-tacking machine has central electrode on which combustion-chamber shell, exit shell, and cap for J-47 jet engine are located. Expanding arbors at top and bottom grip the assembly, then footswitch is depressed to advance four horizontal electrodes. Machine indexes automatically eight times to form 32 spotwelds in preparation for seam welding



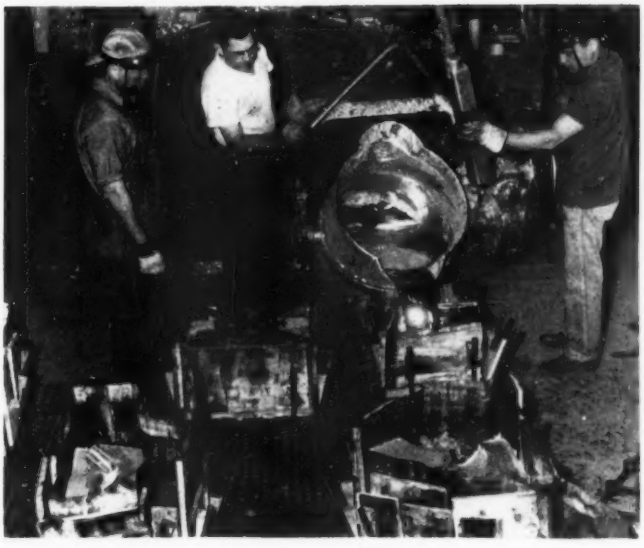
Old drop hammer with rope control still does a job in forming thin-gage stock for exhaust-manifold sections of gasoline aircraft engines. Hammer gives operator good feel of metal flow under the die

New air-driven Cecostamp hammer is controlled by lever that follows ram motion and can produce delicate degree of impact. Machine is faster and much easier on operator

Stainless-steel parts are unloaded from gas-fired, electrically controlled annealing furnace after 1800-F heat for 20 min, which removes work-hardening effects from hammering. Annealing is required between forming operations on stainless

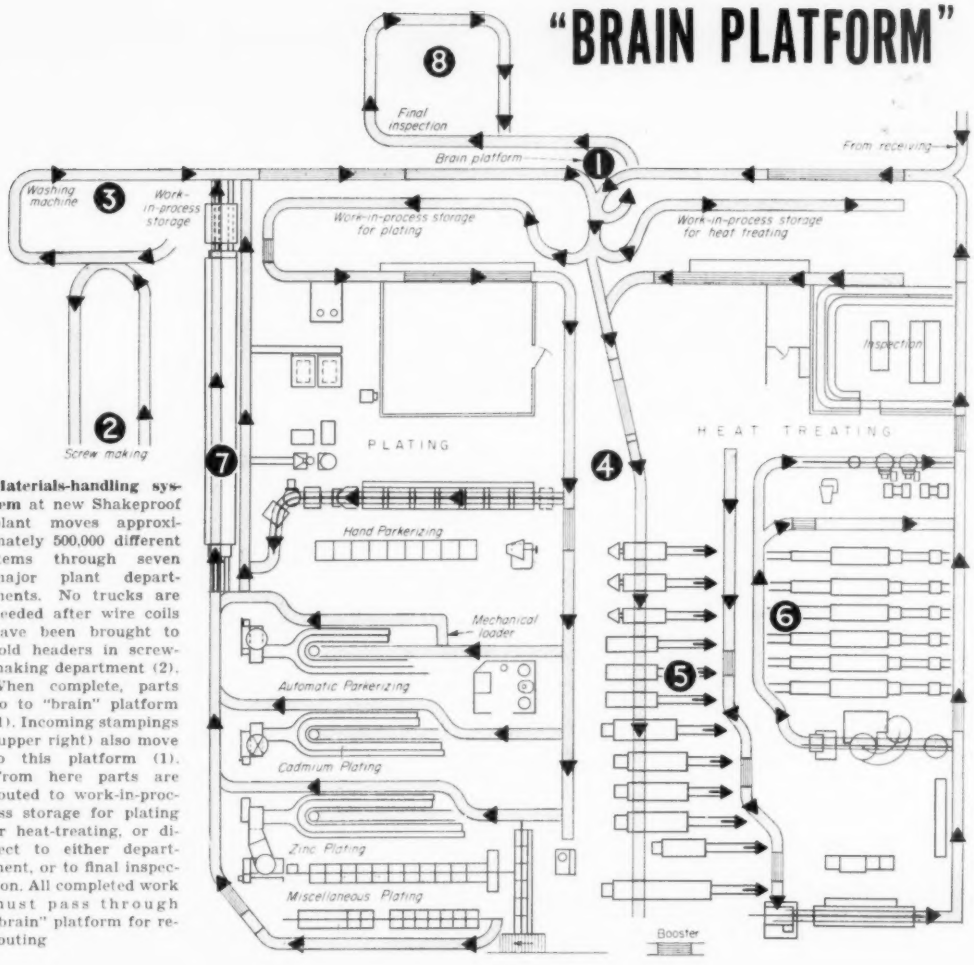


Punch-press department does all one-hit forming that requires light impact, saving time and capacity of hammer shop for larger jobs.

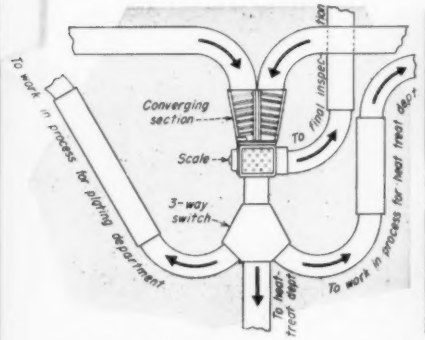


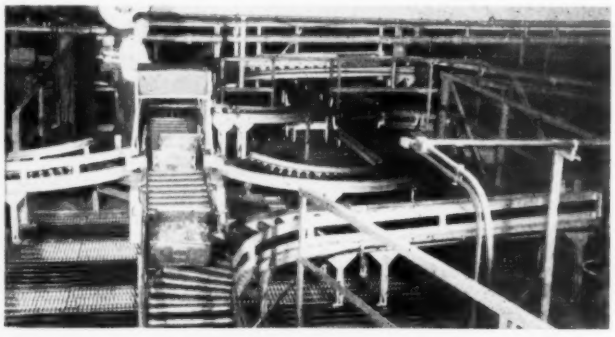
Lead is poured directly into Kirksite die for forming sheet-stock aircraft parts that go into B-50 engines

"BRAIN PLATFORM"



Materials-handling system at new Shakeproof plant moves approximately 500,000 different items through seven major plant departments. No trucks are needed after wire coils have been brought to cold headers in screw-making department (2). When complete, parts go to "brain" platform (1). Incoming stampings (upper right) also move to this platform (1). From here parts are routed to work-in-process storage for plating or heat-treating, or direct to either department, or to final inspection. All completed work must pass through "brain" platform for re-routing





1 **"Brain" platform** is nerve center of work-in-process conveyor system. Two incoming and four outgoing conveyor lines meet at this center. Here tote-pan loads of parts or assemblies are weighed for wage-incentive and production-control records, then are rerouted. Switch is 3-way flexible radial roller type

SPARKS FULLY CONVEYORIZED PLANT

Small lots in infinite variety are moved on conveyors through all production operations at Shakeproof's new screw-products plant. Central control station, or "brain," is key to successful routing

BY RUSSELL M. WICKS
Assistant to President
SHAKEPROOF, INC.
DIV. OF ILLINOIS TOOL WORKS

EVERY item of cost is of major importance in the screw-fastener industry, where competition is keen and customers search continuously for high-quality products at the lowest possible price. So full consideration was given to the cost-cutting possibilities of recent developments in plant layout, materials handling, and production methods when planning Shakeproof's new screw-fastener plant in Elgin.

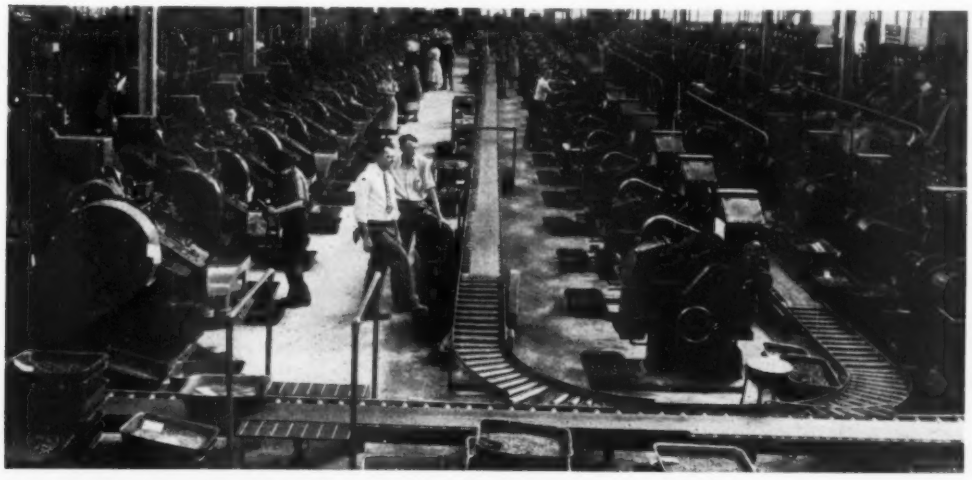
These studies were complicated by the great variety of sizes and types of fasteners to be made, and by the problems involved in keeping job lots of small parts from becoming mixed while being moved from operation to operation. It has been estimated that equipment and tools are available for producing more than half a million different combinations of screw-and-washer assemblies — including different screw sizes and lengths, various head designs and different types of self-tapping screws, various lock-washer and clip designs, and the several different finishes and heat-treatments that can be applied to suit product and customer requirements.

Layout Is Functional

In the new plant, means are provided for processing each order separately while making parts on a mass-production basis to hold costs at minimum levels. Plant layout is on a functional basis, with similar machines and similar operations grouped together, rather than on a straight-line basis, because of widely varying operation sequences. Only two power lift trucks are needed in the entire plant—one for handling coils of wire from storage racks to the cold headers in the screw-making department, and the second for stacking pallet-loads of packaged fasteners in the warehousing section of the shipping department. Overhead cranes move coils in the coiled-stock receiving and redrawing areas. However, all other movements of work-in-process are accomplished on gravity-roller and power-belt conveyors, with a central station for routing tote-pan loads in any of several directions as specified on routing tickets accompanying each pan.

Tote-pan Loads Are Standard

The standard tote-pan load is 100-lb of parts or fastener assemblies. Routing tickets in each pan



2 **Screw-making department** is layed out with production units in long parallel lines served by power-driven belt conveyors. Tote-pan loads of parts from work-in-process storage area in foreground are scheduled for conveyor delivery to machines by production control

make it possible to process individual pan-loads through some of the production operations without the necessity for holding individual loads until the entire order has been accumulated at check points.

Two types of conventional tote pans are used for most parts movements. One is a $15\frac{1}{2}\times23\times5\frac{5}{8}$-in. nesting pan for handling screws prior to assembly with lockwashers or clips. The other is a $16\times24\times7$ in. stacking pan for handling stampings and assembled fasteners where weight would damage the parts if nesting pans were used.

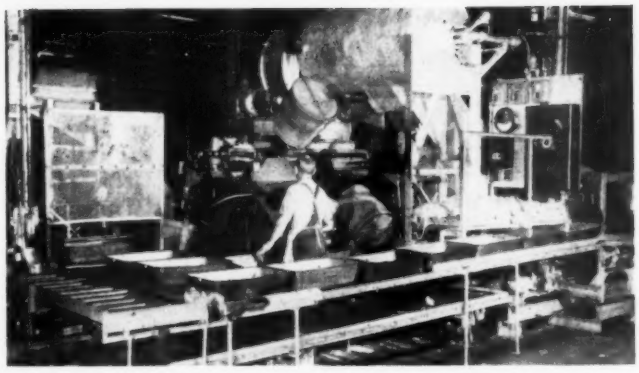
A third pan, fabricated from perforated sheet steel, is used in the plating department when parts are baked to eliminate hydrogen embrittlement. This permits oven atmosphere to circulate through the load. This pan also is used in the heat-treatment department to transport hardened and quenched parts to a washing machine prior to delivery to draw furnaces.

"Brain" Is Main Routing Area

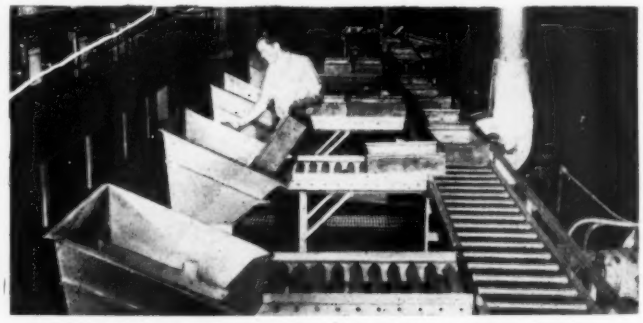
Heart of the mile-long conveyor system is the control platform located 104-in. above the floor at a point conveniently central to the plating, heat-treating, and shipping departments. Known as the "Brain" throughout the Shakeproof organization, this control station is the focal point for two incoming and four outgoing conveyor lines. Here an operator weighs each pan load and routes them to outgoing conveyor lines according to schedules provided by the production-control department.

Incoming stampings (lockwashers, clips, etc.) pass through the receiving department, where they are washed and loaded into stacking-type tote pans for delivery by conveyor to the "brain" platform. From there, they go to the heat-treating or plating departments, if necessary, and then to the final inspection department before delivery to a stock room to be held until needed for fastener assembly operations. Another gravity roller conveyor takes the stampings from this stockroom to the assembly area. About 40,000-lb of stampings are received each day from plants in Elgin and Chicago.

Screw products are completed in the screw-making department before delivery to the "brain" platform. In this department, a series of five power-belt conveyors serve long lines of cold headers, head and shank slotters, thread rollers, Sems assembly machines, and special fastener assembly units. Conveyors deliver and take away pan-loads of parts as individual operations are scheduled and completed.



3 **Automatic washer** cleans screw parts at rate of 200 lb/min. Automatic loader (at left) dumps pan into hopper. Each pan holds 100 lb and goes into separate barrel for 9½-min cleaning, rinsing, and drying cycle. Barrel automatically is dumped into clean pan at discharge position

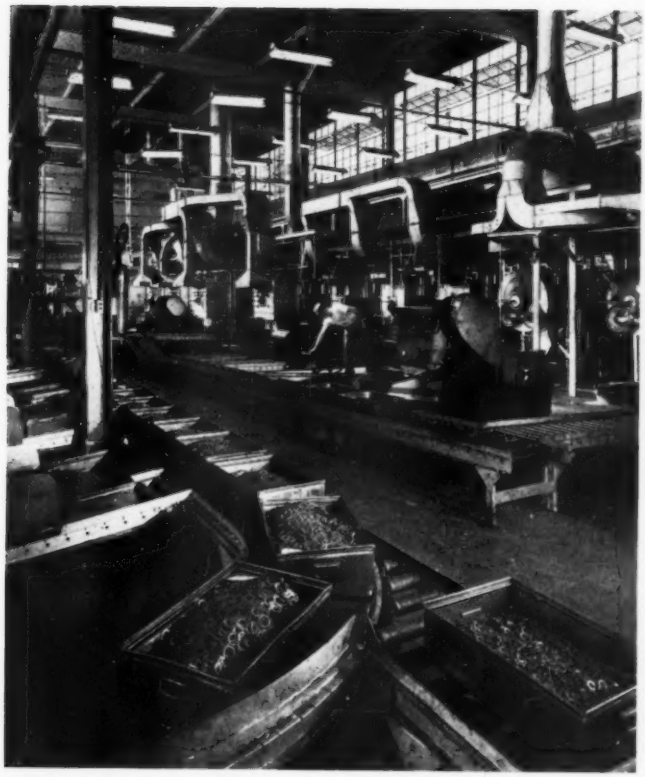


4 **Above heat-treating furnaces,** operator dumps parts into hoppers, then sends empty pans by chute to pick-up point on lower level. Syntron vibrators feed parts from hopper into furnaces

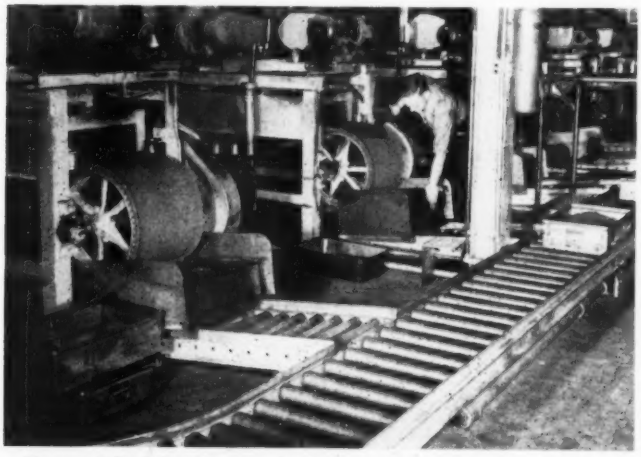
New Washer Keeps Parts Separated

Following each operation in the screw-making department, pan-loads of parts are delivered by conveyor to a Frederic B. Stevens Model C washing machine where the parts are cleaned in a hot caustic solution, rinsed in hot water, and dried. This 19-barrel washer was installed to insure keeping each pan-load of parts entirely separate from all other pan-loads. Only one panload is cleaned in each barrel of the machine.

This complete separation of parts was not possible in the original setup of the screw-making department, when a drum-type parts washer was installed. Parts were passed through this machine by a helical flight inside the perforated drum, and it was thought that by spacing loads far enough apart when charging the machine, complete separation would be accomplished. But this was not the case. Some parts would feed faster than others and job lots would become mixed. This was not the fault of the machine — it did a very effective job of cleaning the parts. We just selected the wrong unit at the start.



5 **Heat-treating department** has gravity roller conveyors to transport pan-loads of parts from quench-tank unloaders (background) to parts washer, then to draw furnaces, and inspection area. Furnaces are mechanized for low-cost operation and have automatic controls to insure high quality



6 **Furnace belts** bring drawn parts to tote pans in which they originally were delivered to heat-treating department. Parts then go by conveyor back to "brain" platform for transfer to other departments. Pans need seldom be lifted off conveyors

The complete separation of parts in job lots is a worthwhile practice in any screw-fastener plant. During the war years, Shakeproof spent about $28,000 each year on parts-sorting operations made necessary because of mixups of similar parts during production, cleaning, or finishing operations, or resulting from spillage of pan-loads transported through the shop on trucks. Today, with production more than twice that averaged during World War II, sorting costs have been cut to less than half that sum—because we now take care to avoid mixups by making it hard for them to happen.

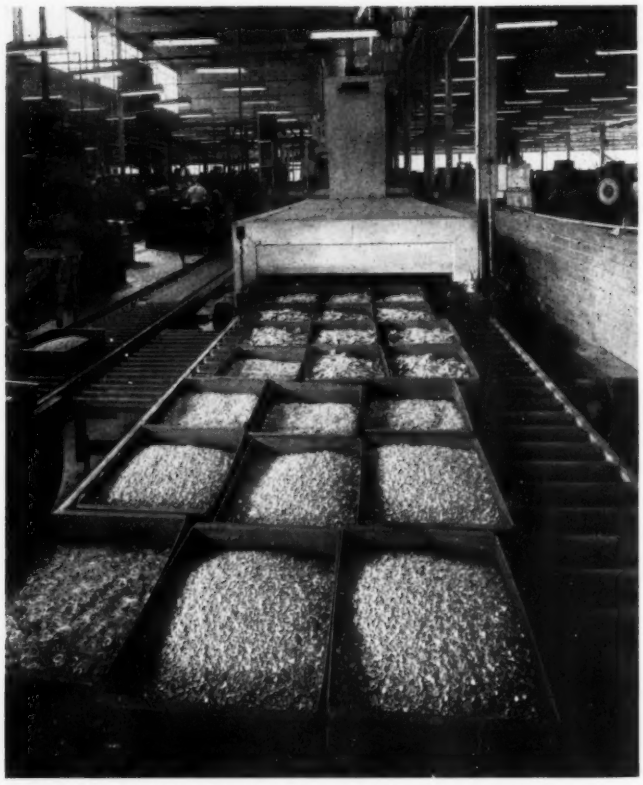
Cleaned screw-parts go to work-in-process storage area for rescheduling through the department when additional operations are to be performed, or are sent along to the "brain" platform by belt and roller conveyor if all screw-making and assembly operations have been completed. From the control center the individual pan-loads of threaded parts may go to the plating or the heat-treating department, if hardened or finishing operations are specified, or they may be routed direct to the final inspection and shipping departments.

Heat-Treat In Economic Lot Sizes

Because both the heat-treating and the plating departments are set up for economic operation with lot-sizes differing materially from the 100-lb pan-loads in which parts come from the screw-making department, tote-pan loads for these departments generally are sent from the control center to storage areas where complete work orders are accumulated before further processing is scheduled.

For heat-treating, parts go back to the control platform and then to a gravity roller conveyor above the loading ends of rotary and reciprocating hearth hardening furnaces along one side of the heat-treating department. Here an operator spends an average of 20 min/hr dumping parts from tote pans into chutes leading to loading hoppers in front of each furnace.

When an order is scheduled for plating, an operator in the plating



7 **Conveyors in plating department** move plated parts in perforated pans through gas-fired recirculating oven. Parts are held at 400 F for 2 hr to eliminate hydrogen embrittlement. Parkerized, enameled, tinned, and burnished parts are not baked, but move along conveyor parallel to oven which brings empty pans to oven unloading station

work-in-process storage area places all tote pans in the order back on the conveyor leading to the plating area. Here conveyor lines aid in moving the pans of parts to and from the plating machines, or to tinning, enameling, or burnishing groups. Pans then move by conveyor to the conveyor line that delivers them to the control center.

All work completed by the plating and heat-treating departments must pass through the control center for rerouting to other centers. Most of these parts, and all assembled fasteners, are sent to the final inspection department directly from the "brain" center. This department is circled by a roller-conveyor loop and by several lines of roller conveyor sections on which pan-loads of parts can be stored while sampling inspections are made. Approved pan loads then are sent directly to the packing and shipping department, or back to the shop when additional operations are to be performed.

Application of the "brain" concept has permitted full conveyorization of all production operations, yet has retained the overall flexibility of routing that is required for moving a variety of products through the plant. Costs are down and the amount of manual labor required for handling has been greatly reduced.

8 **Final inspection** is last station before completed fasteners are delivered to shipping department. Storage lines of roller conveyor sections permit holding pan-loads while checks are being made, without interfering with movement of other parts

Controlling Die-Casting Flash

BY W. M. HALLIDAY

Getting rid of flash is the biggest second-operation headache in die casting. Eliminating this non-productive chore is just about impossible; but reducing it to a sensible level is both possible and practical. The key is better die design. Time-takers like filing, tumbling, sanding, snagging, and trimming with special tools and auxiliary dies can often be cut down by practices that are fundamentally good die design, but which are slanted toward the special problems in die casting. Following are some general rules, practical hints, and tricks of the trade that can save your die-casting shop money.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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One trouble with die-casting alloys is that they can easily penetrate die openings larger than 0.002 in. thick. Therefore, flash is a constant source of trouble. Even where mating die surfaces match reasonably well, and where die-locking pressures are supposedly adequate, flash can form along main parting lines and around joints where cores run into the dies. If a good finish is required on the product, and especially if the product is later to be plated or coated in any way, this flash must be eliminated, regardless of how much it costs.

All the accepted methods of taking flash off castings once it has formed are practical and acceptable—provided these methods are applied intelligently. But a better approach is to prevent flash before it ever forms; before the die has been installed; even before it has been built. The problem is working within the limits of the die-casting technique to design dies that will prevent flash, or will only produce a limited amount of it.

Die Design

Flash control, in the light of die design, is a matter of keeping in mind those die conditions which may result in flash formation. They are well known, generally, so the object is to minimize them.

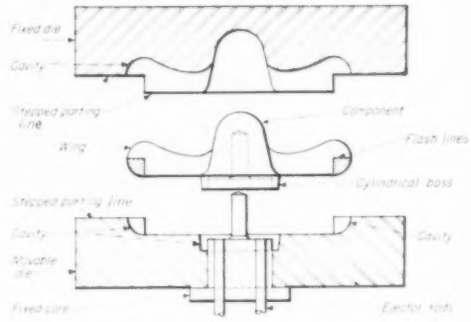
First, though, the product design should be examined to see just how difficult flash removal will be—if flash does form. Some shapes do not lend themselves to ready deflashing by any standard methods; and even though special equipment might be thought up to take care of them, the expense would be a stumbling block. On these shapes, therefore, the designer must be unusually cautious with his design to cut flashability to the bare bone.

Even if flash on a given design may be easily removed with readily available and economical equipment, lost-time, overhead, and labor charges on the deflashing operations seldom overbalance the extra costs of designing and building dies that will control flash as much as possible.

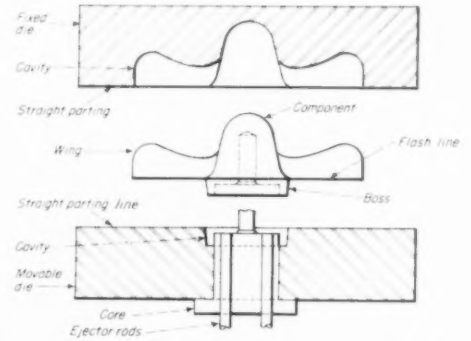
Often the die designer is restricted in his choice of casting plans by a product design that cannot, under any circumstances, be altered. Here he may be in trouble: forced to a die design that allows flash formation, and to a production plan that will result in extra labor and expense. When he is not too restricted, therefore, he is in a better position to specify the product design, die design, and manufacturing technique so production and profits will be highest.

For example, one designer was faced with a small wingnut for an auto window. The part was to be chrome-plated, so finish had to be good. Two methods of parting the dies were available with the original product design intact:

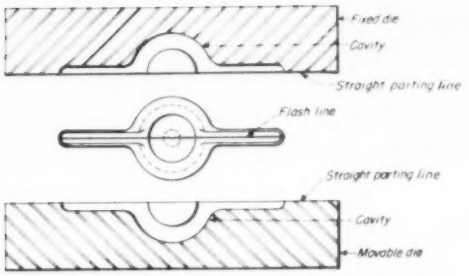
The parting plane could run along the bottom of the wings, above the lower boss. But two steps, one at each wing end, would have to be made. The die blocks would have to be machined carefully, matched perfectly, and operated with care. A die of this design was actually made, at one time, but it caused a lot of trouble. The main guide pins and their holes wore, allowing misalignment of the rounded



Wingnut for auto-window fitting is zinc alloy, later chrome-plated for high finish. Original design placed stepped parting line through center of rounded wing ends, forcing careful die fitting, but still resulting in excessive flash



Revised design of both part and die places parting line at bottom of wings (edges not rounded completely), so line is straight and flash is easily removed with simple trimming tool



Alternate design placed parting line in different plane, through wingnut ridge. This was not adopted because any flash would ruin plating job, or would require intricate trimming tool

wing sectors in the bottom die. Eventually, errors as large as 0.007 in. cropped up.

Another possible arrangement was to split the wingnut vertically with a parting line, placing half the nut in each die. But this idea would lead to flash ridges around the top of the nut, which would hamper finishing and plating. A trimming tool for the job would be expensive, and misalignment of the dies would ruin the job.

The best solution was to run the parting plane under the wings, as in the first plan, but without the steps. To do this, the product design had to be changed. Luckily, it was possible to convince the customer that this was to his advantage; so the lower edges of the wings were made flat, with a sharp point at the end. This placed all of the wings in the upper die, and only the hub in the lower. A fixed core formed the blind hole, and ejector rods were run through this core.

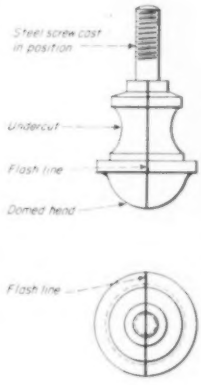
The only flash that developed was on the parting line and on the hub, where the ejectors hit. All of this was easily removed because it was on noncritical surfaces, was well exposed, and would not interfere much with the plating job, even if it were not perfectly removed.

Another small, seemingly simple product that might cause some production trouble is a mild-steel machine screw, about which a knob is cast. The original design for this part showed a concave radius in the barrel of the knob, which really was an undercut. If this were cast with the knob horizontal, the parting line up the side of the knob; any flash would show up on the barrel. Splitting the die in half this way would also lead to misalignment.

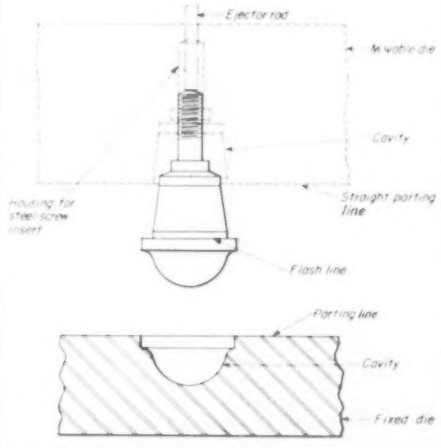
Deflashing would have to be done with an expensive form tool operating in a lathe to turn off all flash—a setup that might be more costly than the original casting job. In addition, some sort of flash would be left by the gate, and if this were on the undercut, it would have to be removed completely.

But a product-design change from the concave barrel to a plain tapered one would allow locating the parting plane through a shoulder, where the flash would be less objectionable, and would undoubtedly be easier to remove. This was done, and flash was taken off by pressing the head through a round trimming die.

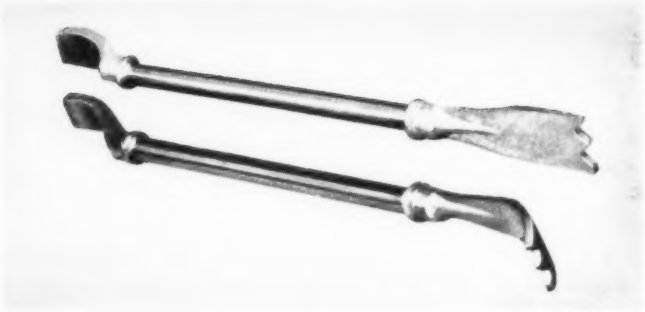
Two important features of die castings which are not always appreciated are that they can be cast directly onto other metals with no more holding device than a slight knurl or nick on the harder metal, and that they can be easily bent after casting. These factors often make die design and manufacture much easier.



Machine screw with zinc-alloy knob cast around its head was designed with concave section on knob, forcing parting line to be located through screw axis. Dangers were poor matching of knob halves, and heavy flash formation



New knob design allows parting line perpendicular to screw axis at edge of heavy shoulder. Casting is surer to be concentric, and flash can be removed easily with plate shearing die



Fireplace-tong leg is nicked at ends, then claw and head cast on ends to be held by burr. Cavity is nearly all in one die, which places parting line along edge of claw inside the curve after claw is bent

For example, some fireside tongs were to be made. Each arm of the complete tong had a die casting on each of its ends—one a fairly simple knob; the other a curved claw that would grip firewood or coals. The claw casting could have been made complete in the die, but it turned out to be easier to cast it flat, with the parting line along one edge, and then to bend it in a simple press die to the curve required.

Both die-cast ends were assembled to the main rod of the tong arm in the die. The rod was loaded vertically in the die, held in place by clips and stops. Before loading, each end was nicked in a press tool to provide a key that would hold the die-cast end firmly in place. To assure a perfect seal around the insert when the die closed, the rods were ground in a centerless grinder to within a 0.00025-in. accuracy before casting, which also simplified later polishing operations.

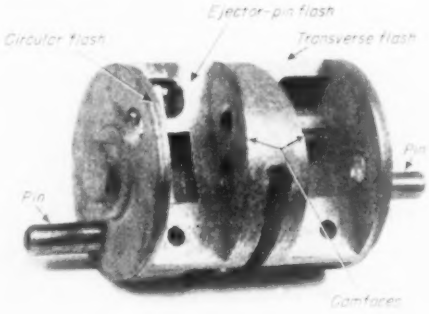
On another job—a coin-shifting barrel for a vending machine—the piece had to be die-cast within a 0.004-in. tolerance on the OD, with all slots and holes to be produced accurately, and with mild-steel pivot pins inserted in each end concentrically. A bridge of metal between two slots in the barrel was to act as a cam for a lever in the coin mechanism, and no flash could be allowed on this surface. To eliminate a retractable slide at this point, the parting line was run along the OD at the root of the slot, meeting circular parting lines at each end which were formed because end slides were required to insert the pins. The pins were knurled to hold in the casting, and inserted in blind holes in the slides. Cores for the large slot in the barrel and for six smaller slots and holes were mounted in the movable die block, arranged for extraction simultaneously with the ejection stage.

This casting was large, weighing over 6 oz, and because of the various slides and cores required, only one cavity could be placed in the die. Yet, an average of 2 castings per minute was maintained, which was high considering the accuracy of product needed.

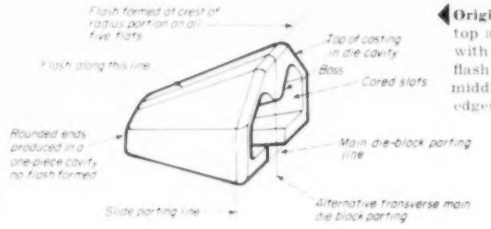
Some undesirable features in component design, which make for excess flash, are illustrated by a bearing bracket for a special hinge mechanism. The casting had five flats, all tapering toward the rear, closed end, and with all end edges radiused. Now, the back radii would cause no trouble, but the ones at the front edges, near the opening of the cored-out T-slot, would cause several snags.

Two alternate die designs were considered: One would place the parting plane on the slotted base, and would require a retracting slide with a T-core and suitable cavities to form the boss and the radiused ends of the five planes of the bracket. This would mean two parting lines, though, and would produce flash at the crests of the radii. The shallow cavities in the core slide would have to match the die perfectly, requiring accurate machining and layout, and a good bit of fussy adjustment of the die set. Wear would throw the whole alignment out rapidly, so the design was discarded.

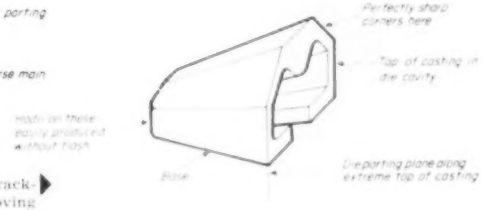
Even if the design had been perfectly carried out, and if all mechanical difficulties had been overcome, flash would form anyhow. This would be difficult to remove; for die-trimming would not be possible, and grinding or sanding might remove too much material. Both of these are common dangers, and are often main sources of die-casting inaccuracies.



Casting for coin machine requires good finish and exact location of pins that act as journals. Pins are located by retracting slides working at each end (parting lines on body shoulders). Die cavity is split so main parting line will be at edges of body slots


Flash formed at crest of radius portion on all five faces
Top of casting in die cavity
Flash along this line
Boss
Cored slots
Rounded ends produced in a one-piece cavity, no flash formed
Main die-block parting line
Slide parting line
Alternative transverse main die block parting

Original bearing-bracket design had rounded corners at top and bottom, allowing two alternate die designs. One, with parting line at edge of rounded top end, would leave flash at the round. The other, with parting line through middle of casting, would leave flash on one of the long edges or in the middle of a flat


Perfectly sharp corners here
Top of casting in die cavity
Holds on these easily produced without flash
Base
Die parting plane along extreme top of casting

Revised product design locates parting line at top of bracket, where sharp edge reduces work involved in removing flash, and makes flash less critical

The alternate design would part the main die blocks across the length of the casting, employing a core slide to form the T-opening. This construction would be somewhat simpler than the other because each die block would carry half the total cavity, and the radii could be formed without much trouble. However, flash on the middle plane of the bracket would not be desirable, nor would any slight misalignment of the two halves of the bracket.

A much better design was worked out, and the customer was approached. After understanding the problem, he agreed to a modification. This eliminated the rounded edges at the front, and left a flat surface at the open end of the bracket. Thus, the bracket could be produced completely in one die, with a simple core operating from the other to form the hole. Flash on the sharp, open edges was easily cleaned off. Because the cavity was now a simple one, three could be machined into one die to improve output.

Perfect alignment of the core and die was insured by a tongue-and-groove match, at the open face of the T-slot, which allowed only 0.0005 in. clearance and kept flash small. To seal the open end of the die, the core land was made at least $\frac{3}{8}$ in. wider than the face of the die.

Joints and Parting Lines

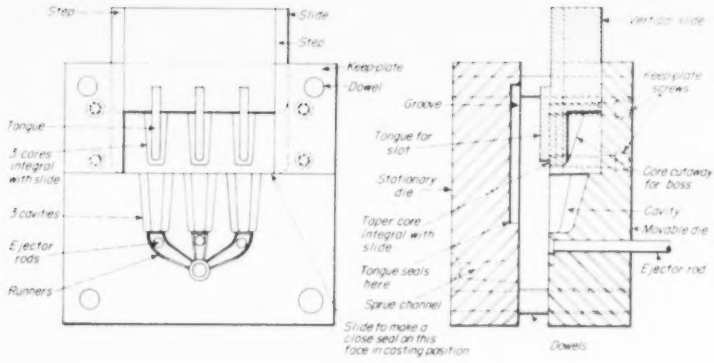
To avoid flash, the number of partings, intersections of separate die members, and jointed surfaces in a die must be kept to the absolute minimum. Part of this problem is the designer's choice of a solid or built-up die.

The shape of a proposed die may make it costly to machine the die from the solid. Therefore, a built-up die, made of parts that are easily machined and fitted together, may be called for. Any of these die parts may contain a portion of the die cavity, or may serve as housings and guides for cores or slides.

Now, when a built-up die has been specified, a careful check of joint lines, their effect on total flash formation, an estimate of the costs of removing such flash, and the effect on the product if smoothing operations must be performed; all these may be worth more than the extra cost of having a solid die made, no matter how complicated. In such a case, use of the built-up design is obviously not warranted.

Also, the designer or cost analyst must remember that the die will start wearing, distorting, expanding, and becoming damaged in other ways as soon as it is put in service; all of which increase the amount of flash produced, and which must be controlled. Another point is that the tendency of the die to deteriorate during service increases as the number of die elements goes up.

To correct these troubles, the die must be overhauled every two months or so, depending upon the production rate, mainly. Joints must be closed, pads reseated, slides and gibs tightened, cores adjusted, and so on. Most of this maintenance is not necessary with a solid die; therefore, the costs of this maintenance must be reckoned as either a die charge or cost of removing flash, and is added to the cost of the built-up die. A balance sheet of estimated die costs, worked out for both types of die for a given job, may often show that the more expensive method (at first glance) may not be more costly at all.



Three-cavity die for bearing brackets has vertical slide with cores for slots. Slide is much wider than cores, insuring a good seal against the top of the dies. Slide works with tongue in groove in fixed die, making alignment positive

Locating Flash Lines

Unless flash lines, or any joints where flash may form, are easily accessible from the outside of the work, their removal will be too difficult. Die partings and intersections should be on a straight side of the component, rather than on curved, irregular or sharp portions. This makes flash removal easier, and may make use of a trimming die possible. Several trimming-die operations on the same part are not usually economical; nor are multiple filing, sanding, or grinding operations on the same part sensible.

Often the slides can be designed and sized so any flash that does form will be on the main parting line, and will be thrown out from the die. For example, a simple box-like casting with 2-in. sides, requiring a core into one side, should be planned so the core slide will not be less than 4 in. square. Thus, if and when a small amount of hot metal does seep between the jointed surfaces of the slide and its guideways, the flash will be separated from the casting.

Runners and Gates

Along one plane only, and on a flat surface is the best location for a gate. It should be kept to a reasonable thickness, and located upon a non-essential surface of the product, if possible. Perhaps flash will not have to be removed at all if it is located where it will later be covered by another part of an assembly.

On some parts, a larger gate formation than necessary may be designed, allowing it to be trimmed neatly in a die later. Where the junction between the gate and part is too thin, either excess flash or a damaged part may result. Where part of a casting must later be machined to size because of special requirements, that surface is a natural location for a gate.

If the gate is too small, it may cause sinks in the wall of the casting because metal cannot be drawn rapidly enough from the gate as the product cools and contracts.

The junction between the shallow gate and deep runner must be well back from the edge of the product. Otherwise, the metal may sever at this junction instead of at the edge of the part when the product is taken from the die, leaving all of the gate as flash.

Taking Up Die Wear

In any die design, solid or built-up, means for taking up wear as the die gets old should be provided. Where large cores or cores for deep holes and recesses must be carried by slides, backlash is bound to develop in time. This increases the flash. But small adjustable gibs or pads can be fitted into the slide guideway when the die is made to allow for adjustment later on. Renewable bushings can often be fitted into die blocks where cylindrical cores are assembled; so adjustments can be made by replacing the bushing.

Cores

A sliding or rotating core plug must have a certain amount of working clearance, hence some flash will be unavoidable in most cases. This clearance is larger than might normally be expected because the die will be heated during operation, and allowance for expansion under heat must be made. A core plug may work smoothly and reliably with a clearance of 0.0005 in. when cold, but this may have to be jumped to as high as 0.004 in. to take care of unequal expansion within the die.

This can be partly beaten by making the core-plug shank much larger in diameter than the portion inside the die, thus locating the joint surfaces or edges of the bearing hole well outside the die cavity.

One not-too-easy solution to this problem is to lap in the core plug with the die block heated up to its normal working temperature. The correct amount of working clearance will then be provided.

Flash around guide holes can be partly overcome by making sure the main dowels or guide pins engage their holes in the opposite die member before any core pins enter their guide holes. The dowels, too, must be maintained in good condition and fitted as closely as possible in the opposite die.

A sharp edge on a guide hole is liable to wear when it is contacted by the molten alloy. This part can be bushed up with a replaceable hardened disk, installed when the die is new. Later, a new bushing can be installed to restore the sharp edge.

Hole cores should be highly polished at all times, and should be removable for repolishing or replacement. Stationary cores should be securely anchored to prevent sideways shift of the die members.

Core plugs with non-circular sections should be turned down to cylindrical shape to nest in round holes in the die block that carries them. This simplifies fitting and assembly, and also makes location more accurate.

Ejector Flash

Small rods through the movable part of the die are the simplest form of ejecting mechanism. These hit a flat surface of the die casting to obtain a fairly uniform thrust over its surface; but flash will form at each contact point.

Flash can be controlled somewhat by the accuracy with which the rods are fitted into guide holes, the evenness of the thrust on the casting, and the manner in which the rods are set relative to the parting line.

But locating the pins to hit a surface that is not important, or the back side of a ridge or boss where the slight flash will not be objectionable and can be left there is sensible. When this is not possible, it may be practical to design ears onto the product to take the thrust. These can be sheared off in a trimming die; perhaps with no extra operating, and little extra construction cost. Another method is to locate the pins to hit a surface of the casting that must be later machined—which will eliminate the flash completely.

Ejector rods must be made a close sliding fit within the die block when the die set is heated. Rods must be securely anchored to the ejector rail; otherwise the pins may loosen and form large flash areas on the casting. The ejector rail itself must be well guided so its travel is in a straight line; but this should never be done with the ejector pins. Pillars attached to the rear of the movable block can be provided for this function.

Sometimes the design will allow ejecting by means of the runner, which can be made larger or bossed so it will not smash or bend.

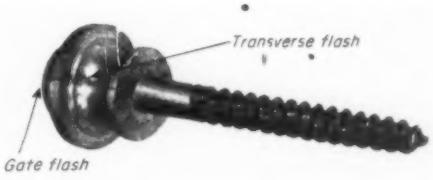
Ejector pins require careful attention during the design stage of die manufacture; and also during production of the components. Loosening, bending (if they are undersize), and thread stripping (if they are threaded into tapped holes in the rail) are ejector-pin troubles to look for.

Collar flash, due to wear of the ejector pins, increases as the die is used. Detachable, hardened bushings in the male die block, in which the rods may slide, control the rods, and are easily replaced if wear does occur.

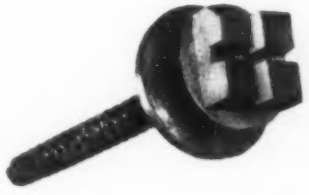
Depression and Fatigue

Die-metal deformation often occurs after the die has been in use for some time. Metal around the edges of the cavity suffers from fatigue and sinking because of pressure. Erosion caused by the hot alloy is also a possibility. These are generally the result of poorly controlled heat-treating of the die, or to poor die design, in which too little metal was allowed at the edges. Never should a die section be made or designed so thin that it cannot conduct heat away at a reasonable rate of speed.

Die-casting dies are subjected to a really terrific amount of punishment because of the severe clamping pressures necessary, the drag and impact of the injected alloy, and the fluctuations of temperatures on the surfaces of the die cavities as the dies are opened and closed. A little extra cost de-



Cast-on head of special screw has undercut that could not be redesigned, so parting line had to be along screw axis. Small flash formation is result of firm die grip on screw insert, good seal around screw shank, and exact die-member mating



Screw-slotted head for another insert job has parting line at shoulder, where flash does not exceed 0.003 in. in thickness. Cavity is in moving die; screw located in fixed die; part formed with high locking pressure

voted to die materials and their choice in the design stage may show great profits after the die has been in continuous operation for some months.

Parting-line flash can be corrected for by lightly regrinding the parting surfaces. But if these surfaces are irregular or not in a single plane, the job is tough. Thus, one more reason why the die designer must select straight, flat parting surfaces every time it is remotely possible.

Air Vents

Extensive venting to prevent air pockets and porosity in the casting is another cause of flash—this type on the sides of the casting. Air vents should be located to lead to unimportant edges of the casting, and should be machined to not more than 0.005 in. of depth. They can be made up to 1 in. wide if large venting capacity is considered essential.

Porosity can often be avoided by overflow walls outside the regular die cavity, rather than by vents. Even though such walls would produce heavy flash, trimming in a die would not be difficult.

General Considerations

Stepped portions, bosses, and beadings on the casting should not be cut by a die parting line or intersection. If flash is formed on a bead, for example, its removal would be fairly easy—but a grinding or buffing tool might ruin the shape of the bead. Circular bosses are difficult to deflash by belt, file, or buffing wheel.

Gear wheels generally present trouble, too. Clean removal of flash from between teeth is a hard job, and takes too much time. Better, provide the gear with a cast-on shroud at one side, thus moving the parting line to the edge of the shroud, and preventing flash between the teeth. The shroud can be trimmed quickly in a die.

Castings of large surface area, through which a number of holes or openings have to be cored, often present troubles. Grilled castings particularly are difficult to cast without forming some flash in the openings. The usual practice is to pass a punch through the openings after casting.

Where whiskers or fringes are not permissible after such a punching operation, it may be necessary to make the cores for the openings slightly undersize, thus forcing a substantial shearing cut of the trimming tool on the sides of the openings. Dies for grilled castings generally are parted behind the grill or at the back edge of the grill.

To prevent progressive increase in flash as the die becomes worn during operation, stringent checking and maintenance supervision is necessary. Even as difficult and unlikely a situation as operating movable cores and slide without getting flash as a result is possible under ideal conditions.

Flash Removal

Normal pleasing appearance on the product usually dictates flash removal, but when electroplating, lacquering, or painting must be done, deflashing is even more important. Where flash is light and well exposed to the outside of the component, it may be tumbled in a barrel. If the surfaces are primarily flat and simple, a file or piece of abrasive cloth, used by hand, may be enough.

Trimming tools, if the run of parts is large, and the trimming tool need not be too expensive and elaborate to trim odd-shaped edges, can be an efficient method of taking off flash. Small fly presses are ordinarily used to operate the tools.

Belt sanding or deburring is often employed, but one danger is that of removing more metal than desired. If this is not too important on the surfaces to be deflashed, the method can be utilized economically.

Costs

No matter how little flash it left on the parts that are die cast, costs are usually quite high for deflashing because of the large quantities of parts produced in a run. Deflashing is therefore highly important. If the parts are small, poorly cast in badly designed dies, deflashing costs can easily jump all out of proportion in the total cost analysis. On small parts, too, the difficulty of getting at the flash, if the parts are intricate, may prove much too expensive. Sometimes it is better design to allow considerable flash where it can be easily gotten at as a price to pay for eliminating flash in an inaccessible point on the casting. Each product design and die design, therefore, must be decided upon its own merits; taking into account the effects of parting lines, die joints, cores and inserts, wear, misalignment, maintenance and correction costs during the run, costs of removing flash, and the result desired in the finished product.

RECOMMENDED PROPORTIONS OF CORED HOLES IN DIE CASTINGS

DIA OR THINNEST SECTION	MAX DEPTH OF HOLE
1/10 in.	3/8 in.
1/8	1/2
5/32	3/4
3/16	1 1/8
1/4	2
1/2	4
3/4	6
1	8

SOURCE: ALUMINUM CO. OF AMER.

ROUND TABLE

Little Pitchers, Big Ears

"Ed, I've got a funny problem on my hands. You know Tom Lacey—a good man. Something's happening to him, and it's not good. He's getting moody and temperamental. He acts like a prima donna all the time, and his work is beginning to show it. He's slowing up, doing things the hard way, and sometimes just plain wrong. And every time I try to help him, he gives me an argument."

"Maybe you're dreaming up some of that, Al. Are you sure you haven't been riding him? He's a good man—you just said so—and maybe he doesn't like to have you showing him your way of doing things he figures he can do just as well his own way. Better be sure your way is better —and that he hasn't got a bad tooth, or trouble at home, or money problems."

"It's none of those things, Ed, and I'm not imagining anything or carrying a grudge. But he's just added insult to injury—he's been talking about me behind my back, at home."

"Ye gods, who doesn't? Don't you blow off steam at home about your men? You can't blow here, except to me, and you can't keep all your feelings bottled up."

"Sure, I blow off at home. But Lacey's been saying I'm picking on him, acting the BOSS, and generally lousing things up. You know, Ed, my kid and Tom's play together, and young Al came home last night with the whole story. Tom was telling his wife all about me, and damning me up one side and down the other."

"Well, that's likely to happen to anybody. Remember that old saying about little pitchers having big ears? Tom didn't know your kid was listening, that's all. And your kid may have built the story up a bit in telling it to you."

"I don't think he did, but the point is that Tom should tell me about it if he's sore—not blow off at home."

"Look, Al, be sensible! Why should Tom tell you, when you're already riding him? If he told you how sore you get him, he'd only be building more trouble for himself."

"No, he wouldn't. I'm going to talk to him anyhow—and that's worse than if he had talked to me. Now he will have something to bellyache about!"

"Don't do it, Al. Forget the whole thing. All you'll do by bringing this up is to make trouble for yourself, and for your own youngster. Why should your kid get in trouble because you're in trouble? And, besides, what right have you to dictate what Tom says?"

"Ed, this thing won't get any better until we talk this out, and it may not then. It's gonna be on both our minds until we find out who's wrong —and why."

"You're making a mountain out of a molehill, Al. If Tom is temperamental, it's partly your fault for letting him get that way. You're the boss; why don't you act like it, instead of like a hurt kid?"

IS TOM AT FAULT *for talking about his troubles at home? What can Al do to straighten out the situation, without involving his son? Who is at fault? Your opinions will help others. Discussions of earlier topics appear on later pages.*

Cutting Speeds May Double or Triple...

WHEN SCIENCE GUIDES MACHINING

Cutting speeds, fluids, and temperatures, machinability and microstructure all come in for attention as art begins to yield to research . . .

BY E. J. TANGERMAN, EXECUTIVE EDITOR

THOSE of you who have skipped our articles on machinability and our continuing series on high-speed machining during the last several years, had better go back and take another and more careful look (see Bibliography herewith). Some of it is pretty tough going, but it has tremendous potential importance—or at least so say the savants. And they make it stick by promising doubled or tripled cutting speeds if you use it.

No Splitting

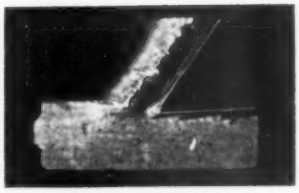
If you'd like a quick summary of recent metal-cutting and cutting-fluid research, get hold of a copy of Hans Ernst's most recent paper.[1] He makes the point of our headline—and goes on to prove it. What's more, he kills, once and for all, the 50-year-old idea that the chip splits off ahead of the tool, providing a crevice into which cutting fluid can enter and be drawn up the chip-tool interface by capillarity to form a wedge film.

Instead, he points out that no two surfaces in "close" contact are in complete contact (even a pair of gage blocks wiped together can be cocked—see *AM* Dec. 1, '49, p. 77). There are always high spots in intimate contact, under pressures as high as 100,000 psi in the case of chip and tool, and low spots which are really a network of microscopic channels and pockets. It is through these channels that the cutting fluid, or its vapors, must pass, after being drawn from tool face, flank, or side by powerful capillary forces.

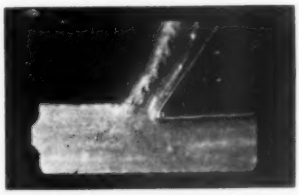
Obviously, this fluid or vapor cannot prevent metal-to-metal contact of the high points—no fluid could withstand 100,000 psi. What's more, temperatures there are also extremely high—equal to the melting point of the lower-melting metal at the microscopic contacting spots and above 1000 F average. Says Mr. Ernst: "Under such conditions, it is difficult to see how any fluid can reduce friction, but there is abundant evidence that certain fluids *do* reduce it."

It is rather generally known now cutting fluids perform two major functions, lubricating and cooling, the first to reduce friction between tool and chip, the second to remove heat from chip, work and tool. (Practically, of course, the fluid also washes chips from the cutting zone.) If the fluid does its job, you get longer tool life, improved finish, and lower costs. Temperature of the cutting tool mainly determines its life, and friction between chip and tool determines size of the built-up edge, hence finish.

I watched one experiment in Mr. Ernst's laboratory that brings out these points. A piece of aluminum alloy was planed at the very slow speed of 2 ipm so cutting action could be watched through a microscope. At such a speed, friction is at a maximum, so theoretically a "high-lubricity" cutting fluid is required. Without any fluid, a large built-up edge is quickly formed, and the surface is very rough as a result. Just for laughs, Mr. Ernst added a drop or two of benzine as a "coolant." The built-up edge promptly grew much larger and the surface of the work was galled and torn. Then he added a drop or two of carbon tetrachloride — quite similar in appearance and characteristics to benzine (although neither is a good lubricant in the accepted sense). Chip form changed from Type 3 to Type 2, the built-up edge passed off with the chip, and the finished surface became clean and bright (photos).



Type 3 chip formation, when no cutting fluid is used, as shown in an enlarged frame from a high-speed movie



Type 2 chip formation, with carbon tetrachloride as a coolant. The material in each case is aluminum alloy (Al 99.3, Si 0.4, Fe 0.3) and the cutting speed 2 ipm (Ernst)

This has led Mr. Ernst and his associates to the belief that chemical action is importantly involved in the mechanism of cutting-fluid action. As we said earlier, 100,000-psi pressures and 1000 F temperatures preclude any cutting-fluid action to prevent chip-tool contact at high points — and both, plus the chemical cleanness of the abutting surfaces, results in junctions or welds at those points. The chip can slide away only by shearing these junctions, hence high friction results.

But assume that the cutting fluid contains chemically reactive materials. Then the highly reactive and freshly cut chip surface combines with it under the existing

[1] "Fundamental Aspects of Metal Cutting and Cutting Fluid Action," by Hans Ernst, Director of Research, The Cincinnati Milling Machine Co., Cincinnati, Ohio. Presented before the New York Academy of Sciences, and published in the Annals of NYAS, Vol. 53, Art. 4, "Fundamental Aspects of Lubrication."

temperatures and pressures—sulfurized and chlorinated additives producing metal sulfides or chlorides, free fatty acids forming metallic soaps and complex polymers, etc. Some of these products are solids, and can coat the contact areas with a solid surface film that no pressure can squeeze out. Thus a microscopic layer of weak solid material prevents metal-to-metal contact and has very low resistance to shear. Chemical analysis proves such solids are present—the water or oil is merely the carrier.

This suggests that chemical properties of a cutting fluid are the major factors in helping it reduce friction, so control of chemical reactions at the chip-tool interface is the key to major advances in cutting-fluid performance.

Along that line, keep your eye on current developments in cutting fluids. For the "special" job — meaning good finish, close tolerances, tricky materials, or high speeds — you'll probably need a special fluid. There are half a dozen new fluids, each with special characteristics, for cutting CI, or running at high speeds. There are several new ways to apply cutting fluid, too, at least one not yet announced. The future on fluids is wide open, and traditional ones will have to battle with new types.

High-Velocity Cutting

Lower tool loads and less surface deformation on finished parts are pointed out by Leif Fersing of Jones & Lamson as major advantages of higher cutting speeds.[2] Tool life can also be very good, even though the rate at which heat is generated at the tool point is practically proportional to cutting speed. Better materials, tools, coolants and methods are responsible.

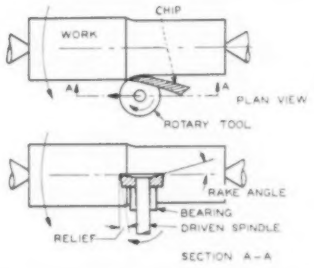
It takes careful attention to all factors, and equipment strong and powerful enough for the job, to double or triple ordinary speeds, but there are *no drastic changes in tool loads and chip temperatures* as cutting speed goes up from 300 to about 1400 sfpm. Tool finish and angles, however, have a vital effect on tool life, and chip breakers and cutting angles must be modified to suit both speed and type of steel.

Chip breakers and rake angles have a great influence on the average temperature of a chip. In one case, Mr. Fersing shows a poor design of chip breaker for C-1118 steel, resulting in improper chip shape and purple-blue color. This is in sharp contrast to the common belief that blue chips indicate efficient machining.

Chip temperature goes up when a tool breaks it into smaller parts and/or forms a heavier cross-section, but chip temperature stays

[2]"Carbide High-Velocity Turning," by Leif Fersing, experimental engineer, Jones & Lamson Machine Company, ASME Paper 50-A-127.

Rotary tool for rough turning (Shaw, Smith & Cook)



ROTARY LATHE TOOL STAYS COOLER AND SHARPER

A novel cutting tool in the form of a disk that may be rotated about its axis will be described Nov. 27 before the ASME in Atlantic City by M. C. Shaw, P. A. Smith and N. H. Cook of MIT. This rotary tool corresponds to an equivalent oblique tool having an angle of inclination whose tangent is equal to the ratio of the tool and work-surface velocity. In addition to the inherent feature of the oblique tool of providing a greater effective rake angle without a corresponding decrease in actual included angle of the tool, the rotary tool:

1. Provides a rest period for the cutting edge, thus enabling the edge to be cooled and the adsorbed film on the tool surface to be replenished between cuts.

2. Provides a positive means for introducing a cutting fluid between tool and chip, thus offsetting the tendency of the chip and finished surface to prevent the fluid from reaching the tool point by their adverse directions of motion.

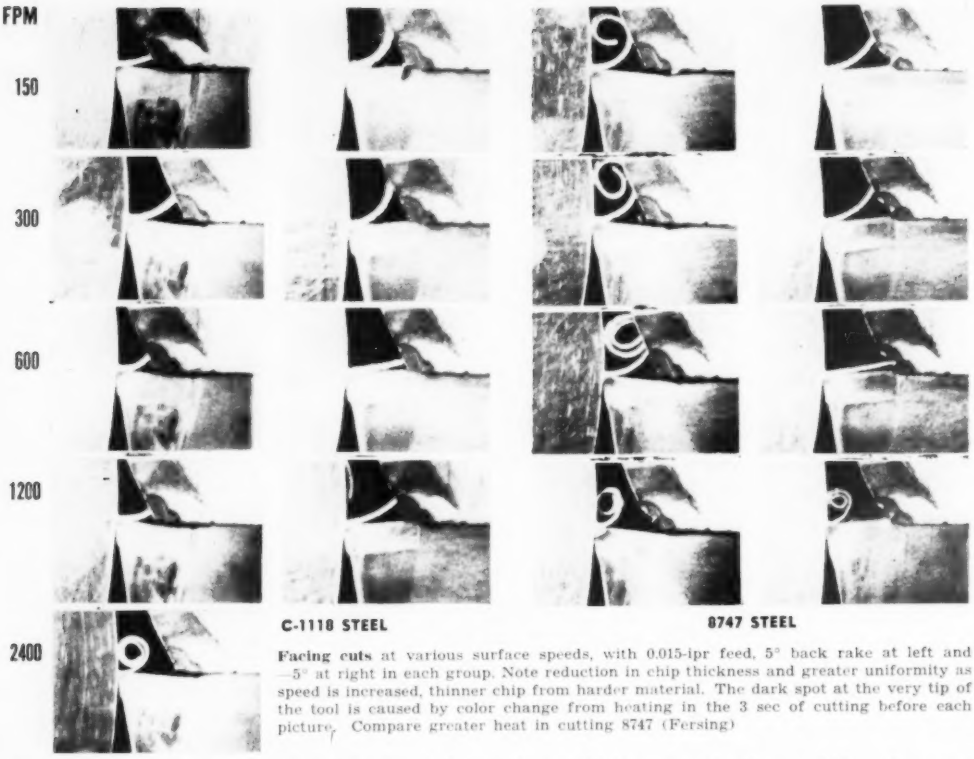
3. Enables the relative chip velocity to be increased to provide a lower coefficient of friction without necessitating a corresponding increase in the rate of metal removal.

A rotary tool with 10° rake angle can reduce total power required to make a given cut by about 30% and will at the same time operate at a temperature about 400 F lower than an equivalent stationary tool. To do this the tool should be operated at optimum speed, which appears to be 80% that of the workpiece. Under these conditions, power to drive the tool will be half that required to drive the work.

Rotary cutting appears to be practical where a large volume of metal must be removed in a short time. It would seem adaptable to large planer and shapers, as well as to rough turning. In turning it is advisable to make the tool of carbide and reduce the diameter to a minimum to avoid chatter from too long a cutting edge. The 2½-in. dia tool investigated at MIT did not chatter however, even when width of cut was ¼ in.

While no life tests were made on the rotary tool, experience with it indicates a life at least two orders of magnitude higher than that for an equivalent stationary tool. On one test at 950 sfpm, 3/16-in. width of cut, and feed of 0.005 ipr, a conventional HSS cutting edge was destroyed in about 5 sec, while a rotary tool of the same material showed no signs of distress after cutting for several minutes.

Tests were made with a tool having 10° normal rake angle, and the effective inclination angle should be about 40° to operate with minimum friction, total energy, and chip-tool interface temperature. Such an effective inclination is obtained by making the surface speed of the tool about 80% that of the work.



Facing cuts at various surface speeds, with 0.015-ipr feed, 5° back rake at left and −5° at right in each group. Note reduction in chip thickness and greater uniformity as speed is increased, thinner chip from harder material. The dark spot at the very tip of the tool is caused by color change from heating in the 3 sec of cutting before each picture. Compare greater heat in cutting 8747 (Fersing)

about constant after speeds rise above 450 fpm, although tool loads *drop*, especially for steels like C-1118, if chip breaker, feed and depth of cut remain constant. What's more, steels have characteristic chips, that from 8747 steel always being narrower and thinner than that from C-1118 under similar cutting conditions. Generally speaking, the thicker the chip for a given setting, the more machinable the steel—and the more the heat carried away by the chip. Differences between tensile strength and yield point affect chip thickness. As temperature at the tool tip determines both, it has considerable effect on tool loads. This explains why coolant (50 parts water to 1 of wetting agent; no lubricating value) always increased tool loads in Mr. Fersing's tests, and chips were more broken and slightly smaller in cross-section than when turning dry.

On C-1118, loads on a tool without a chip breaker were greater than loads on a tool with a chip breaker at some speeds—probably because chips do not follow the contour of the breaker at higher speeds. Chips hit only at the cutting edge and at the breaker heel.

Differences in machinability of C-1118 and 8747 steels were quite noticeable. C-1118 is very free machining because of high sulfur content, so the limit of speed and feed for a desired depth of cut is apparently motor capacity, at least on short cuts. 8747, on the other hand, requires constant, careful attention to the lapped finish of the tool edge, particularly with positive-rake tools, to obtain a stable cutting condition. Rake angles of −5° gave no difficulties in this respect, even though tool loads were higher than for positive rakes.

Higher cutting speeds reduce chip thickness and increase uniformity of cross-section (which improves finish). They also *decrease* deformation (which is never more than 0.001 to 0.002 in. deep). Deformation is less at high velocities, is less without coolant, and less for higher-tensile steels.

Motion pictures showed alternate quenching and heating of the carbide bit tip (see examples)—very hard on carbide and support for the argument that carbides should be cooled both from above and from below. For this reason, it is probably better to make intermittent cuts dry at high speeds.

In threading a $\frac{3}{4}$-10 bolt of SAE 1040 at 390 fpm, chasers had to be resharpened after every 250 pieces until cutting surfaces were superfinished. Now 700 pieces are threaded without resharpening — indicating the value of high finish.

"Hot-Spot" Machining

Considerable research and some publicity has been given to the method of heating by induction or flame the area of a workpiece just ahead of the cutting tool, the intention being to increase tool life between grinds. The process was originally mentioned in *AM* Feb. 10, '49, p 98, in an article by J. B. Armitage and A. O. Schmidt of Kearney & Trecker. It has been our feeling that the process has definite limitations because of the extraneous heat in the vicinity of a precise machine tool and because the heating to reduce shear

strength of the material will also reduce shear strength of the tool. Research recently reported by E. J. Krabacher and Dr. M. E. Merchant of The Cincinnati Milling Machine Company brings out some interesting points in this connection.[3] Their work shows that tool life will not always increase with increasing workpiece temperature; instead, there is a definite temperature range for best tool life for each work material above, below, or at room temperature. For some materials, this optimum occurs at temperatures over 1500 F, thus is impractical to achieve with present equipment and tool materials.

To begin with, heating the workpiece tends to result in higher temperature at the chip-tool interface, which will soften the tool face so it will abrade faster, thus shortening tool life. But the workpiece is itself softer, so its power to abrade is reduced, and the heat produced in forming the chip is decreased. It is the relative importance of these two factors at any given temperature that determines tool life.

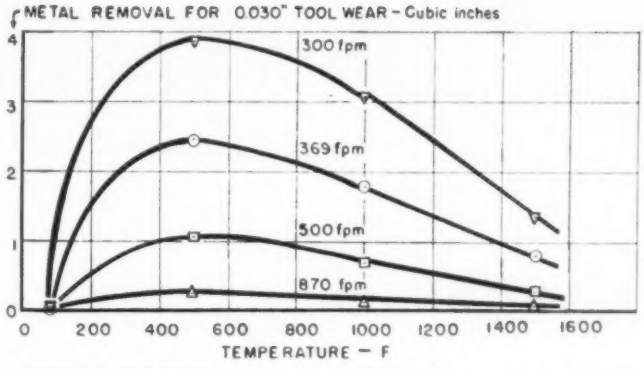
Tests

Three common high-temperature alloys, notoriously hard to machine, were chosen for the tests. Inconel X, Timken 16-25-6, and S-816 were matched against an alloy steel, AISI 3145, as a base, because the latter can be hardened to be normally unmachinable.

Optimum temperature for cutting Timken 16-25-6 alloy turned out to be 500 F (see sketch). This was partly because the interface was actually cooler at 500 than at room temperature. For S-816 and Inconel X, best temperature is in excess of 1500 F, because tool life increased steadily up to that temperature. For AISI 3145, by contrast, heating didn't help—in fact, hindered—because its abrading action is mild at room temperature.

For AISI 3145, as received (180 Bhn), tool life at room temperature was about 7 times that at 1500 F at 1020 fpm. At 350 Bhn hardness, however, tool life at 1500 F was 10 times that at room temp.; after the tests dropped to 340 Bhn.

[3] "Basic Factors in Hot-Machining of Metals," by E. J. Krabacher, research engineer, and Dr. M. E. Merchant, senior research physicist, The Cincinnati Milling Machine Company. ASME Paper 50-A-92.



Optimum cutting condition in the case of Timken 16-25-6 is 500 F. Optimums vary with the material from below room temperature to more than 1500 F (Krabacher & Merchant)

For Inconel X, tool life at 1500 F was 5 times that at room temperature (600 fpm), while for S-816, tool life at 1500 F was 80 times that at room temperature (250 fpm). For the 16-25-6 alloy, tool life at 500 F was increased 55 times, at 100 F it was 45, at 1500 F only 20.

RECENT BIBLIOGRAPHY ON MACHINABILITY AND HIGH-SPEED MACHINING

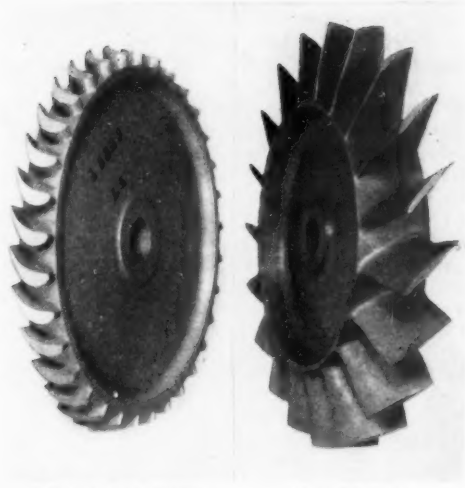
These articles and items have appeared in *American Machinist* during the past two years. Starred articles have been reprinted. Major points were also summarized in a speech by the author at Worcester last May, a limited number of copies of which are available.

TITLE	PAGES	ISSUE
*Are We Slowpokes at Machining?	55-57	Dec. 29, '49
Three-Company Study Develops New Hobbing Technique	96-97	Mar. 6, '50
*Are Shop Men Scared of High-Speed Machining?	85-89	Mar. 6, '50
HSS, Plus High Angles, Mills Like Carbides	122-123	Apr. 3, '50
Tryout for HS Machining	72	July 24, '50
*Are We Riding the Brake in Machining Speeds?	100-106	Aug. 7, '50
*Machining Costs a Billion a Year Too Much	107-114	Aug. 7, '50
Power Declines 2%	78	Aug. 21, '50
*How to Cut Costs with Cutting Fluids	109-116	Sept. 18, '50
Too Fast for Us	129	Oct. 2, '50
Head for the Attic	129	Oct. 2, '50
Friction Sawing Vs Hot Spot	62, 64	Oct. 2, '50
Speed Handling	110	Oct. 16, '50
Harder with Velocity	112	Oct. 16, '50
*U.S. Air Force 1950 Report Proves Machinability Depends on Microstructure	109-124	Nov. 27, '50
*U.S. Air Force 1950 Report—Machinability Data for High-Temperature Alloys	99-106	Dec. 25, '50
High-Angle Milling	321	Jan. 22, '51
Ear Mill	315, 317, 319	Jan. 22, '51
Speed in 1944	165, 167, 169	Feb. 5, '51
High-Speed Turning Qualifies Shafts and Gears	171	Feb. 5, '51
High-Speed Turning	171	Feb. 5, '51
More on HR Milling	136-137	Feb. 19, '51
"We Turned SAE 1045 at 2150 Sfpm"	312	Feb. 19, '51
Upside-Down Drill	78	Mar. 5, '51
High-Speed Turning	102-103	Mar. 5, '51
Hard Steel "Grilled" at a Mile a Minute	110	Mar. 19, '51
*You Can't Be Half-Hearted About Modernization	110	Mar. 19, '51
High-Rake Coolant	87	Apr. 2, '51
Europe Studies Machinability	147-166	Apr. 16, '51
Solid Carbide Saws Cut Clean and Fast	174A	May 14, '51
Chip Problem	202-214	May 14, '51
Acid Pickle Doubles Tool Life on CI	120-121	May 28, '51
More on High Speeds	135	May 28, '51
Old—But Better	140-141	June 11, '51
How to Mill Profitably with HSS Cutters	74-76	June 25, '51
Microstructures of Metals I, II, III	185	July 9, '51
" " " IV, V, VI	121-124	July 23, '51
Metallurgical Considerations in Machining—I	89-92	Aug. 20, '51
" " " " —II	139-142	Sept. 17, '51
" " " " —III	130-132	Oct. 15, '51
" " " " —IV	100-103	Oct. 29, '51
" " " " —V	138-141	Nov. 12, '51
Sweet Coolant	185	Sept. 3, '51
Automatic Hobber . . . at 1000 Rpm	192-193	Sept. 3, '51
Doubling Tool Life	175	Sept. 17, '51
*U.S. Air Force Machinability Report—1951	161-168	Oct. 1, '51
Straight Forming Licks Tough Nitralloy Job	133	Oct. 15, '51
Whirlaway	141	Oct. 29, '51

A NEW TWIST IN 2-DIMENSIONAL ENGRAVING...

. . . and an amazing cabin air conditioner for turbo-powered aircraft, are mutual results of engineering know-how at Stratos Division, Fairchild Engine and Airplane Corp., Farmingdale, N. Y. Here is how, by simple tooling, they made a simple machine produce complex parts in quantity; thus beat a major bottleneck

BY WM. M. STOCKER, JR., Assistant Editor



TURBINE BUCKET WHEEL BLOWER WHEEL

Machined from 24 ST, the turbine wheel is a precise but relatively easy part to produce. On the other hand, the blower appears simpler yet is complicated by the twist in each blade. To produce the twist, a standard engraver was especially tooled

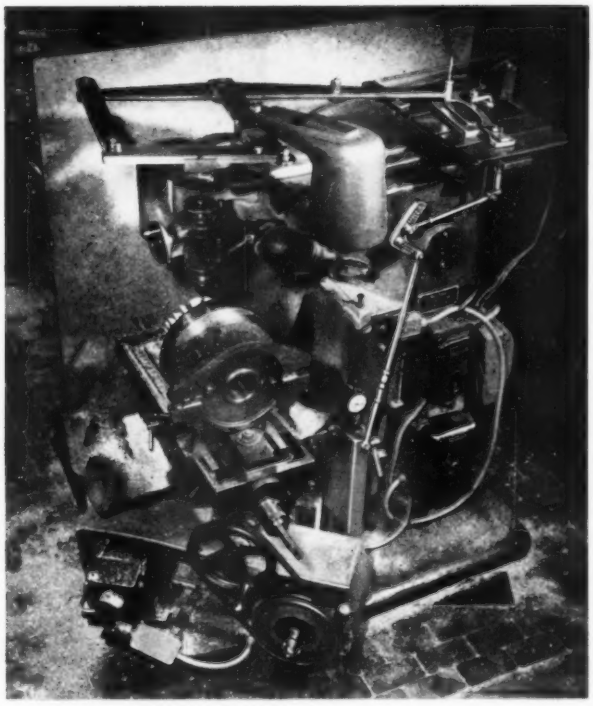
JET FIGHTER and bomber aircraft present severe problems of cooling and pressurization as a result of skin friction at high speeds, solar radiation, and extreme altitude operation. In any category, aircraft efficiency requires that all equipment carried do a maximum amount of work for a minimum weight.

To satisfy both of these conditions, Stratos developed its jet-bleed system of pressurization and cooling. For use in transports, one unit weighs only 40 pounds and requires just 3.7 cu ft of space, but absorbs 55 hp and produces 60 lb per min air flow. Jet fighters use a smaller unit, the NUR 12-2, which produces a flow of 13 lb per min at 14 F and a cooling turbine outlet pressure at design altitude equivalent to desired pressure differential. Bleed air from the jet engine reaches the cooling package at 150-in. hg pressure and 400 F.

The heat exchanger used is 90% effective. A temperature drop of 215 F with an available pressure drop of 4.5:1 is required of the cooling turbine. This is accomplished with a device weighing 14 lb and displacing less than ½ cu ft.

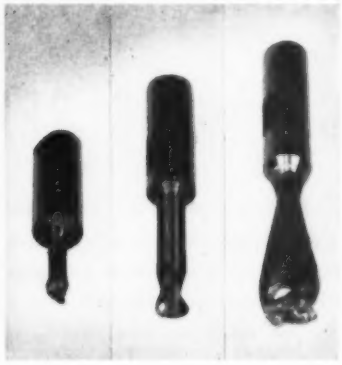
Heart of this "vest-pocket" air conditioner is the turbine and blower assembly, and largely the actual turbine and blower wheels. Both of these are ma-

Prior to mechanical control, each cut on each blade had to be carefully positioned with a dividing head, and operator directed the cutting, which required undivided attention



Twist problem was solved by mounting bell crank on side of engraver. It provides linkage which converts vertical motion of table to horizontal motion of master plate support, hence master moves as cutting proceeds and twist is generated. Blower wheel is mounted in standard indexing head. Motor and drive in foreground provide special feed. Size of master depends upon size and form of blade. This one is 10:1

Carbide form cutters are used for the various sizes and shapes of blades. Cutters rotate at 14,000 to 15,000 rpm and produce thousands of blades before resharpening is necessary. Soluble oil is used as the coolant



chined from 24 ST aluminum bar stock and presented the most serious difficulty in the entire manufacturing operation. Here again, was the problem of accurately machining precisely contoured turbine buckets.

Turbine wheel diameter is 2½ in. An odd number of blades, equally spaced on the circumference, are required to tolerances of ±0.005 in. blade-to-blade and ±0.002 in. for control of true contour. Designed for maximum thermodynamic efficiency, blade height at the inlet is approximately 0.10 in. It increases toward the trailing edge to a height of nearly ¼ in. Wheel diameter is constant, the blade height increase being obtained by ever-deeper cuts into the wheel. This is a rather simple operation, using a Gorton two-dimensional pantograph engraving machine, a templet, an indexing head, and carbide form cutters or endmills.

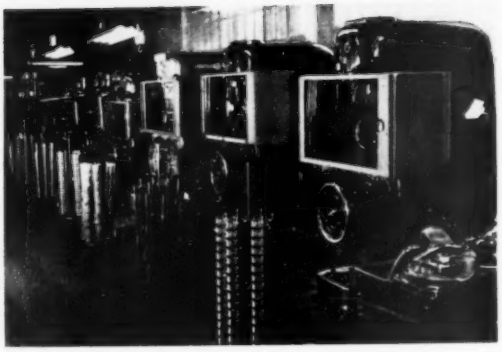
Contour problems

Considerably more difficult was the blower wheel, which is slightly larger in diameter and has fewer blades, but whose blades must maintain a constant air-foil section throughout a predetermined "twist" from root to tip. Fan blades on the NUR 12-2 unit are nearly ½ in. high and on larger models are as much as 1⅛ in. high. Width is slightly less than height. How would you machine it?

Stratos solved the problem by tooling the same engraver used for the turbine wheels. Originally, each individual piece was laid out with a height gage, mounted in a chuck on a dividing head, and controlled by hand. This was very slow and it was far too easy to slip; thus scrapping the wheel. The answer was to use a master plate cut to suit the air-foil section, then twist it relative to the position of the workpiece and cutter at any given moment.

Familiar with aircraft components, toolmen found their answer in a bell crank linkage. First, the master plate support was mounted on a pivot so it was free to move in a horizontal plane. Then the bell crank was affixed to a fulcrum on the engraver column, with one arm connected to the engraver table and the other arm fastened to a vertical pin beneath, and connected to, the master plate support. The master plate was clamped in its proper location on the support. For any vertical movement of the engraver table, there is a corresponding horizontal movement of the master plate support. Hence, when the correct ratio is properly established by adjustment of the linkage arms, any templet form is transmitted to the workpiece, but with the desired twist as well. Some shapes require a slight alteration of the master plate contour as compared with the finished shape desired.

Carbide form tools are used, rotating at from 14,000 to 15,000 rpm. Soluble oil is used as coolant and to flush chips from the work.



Battery of eight gear shaving machines is used to produce a wide variety of straight and helical gear forms. Other gear-cutting equipment includes: Fellows gear shapers and Gleason gear generators for producing bevel gears, spiral bevels, and hypoid gears

CLOSE CONTROLS CUT GEAR REJECTIONS 7600%

Flexibility and quality are two demands which must be met by any company which hopes to survive in the contract manufacturing field. For many years competition was judge and juror, decided who survived and who perished. Now there is a double need, for competition still exists; but even more important is the flexibility necessary to produce rapidly the ever improving military equipment at a quality standard that guarantees effective action in the field. Only modern tools and close process control can make this possible

BY FRANK PETZNICK, Plant Manager
OHIO FORGE AND MACHINE CORP.
Cleveland, Ohio

ALMOST every conceivable design of gear known to Metalworking has been produced in the gear department of our plant. These range from small gears under $1\frac{1}{2}$-in. PD to enormous press "bull" gears 106 in. in dia, 8-in. face, and $1\frac{1}{2}$- to $1\frac{3}{4}$-in. DP, and include: spur, helical, worm, bevel, spiral bevel, pinion, bell, and many others. As gear specialists for many industries, we have an excellent opportunity to study gears of all designs, and gear manufacturing in all of its phases, from start to finish.

Perhaps the best evidence of the importance of close control, and properly applied know-how, to gearmaking, is found in a recent rejection report which shows an over-all average of only 0.52% for the entire year. Before the present controls were employed, rejections ran as high as 40%. This talks dollar and cents sense in *any* business.

From the standpoint of control, the company is fortunate in having its own forging facilities on the premises. Gear quality starts at the source of the material—the steel mill—and the success of the finished product rests upon the care exercised in the forge shop as do, to a large extent, machinability and other process factors. Close control is required in the design of forging dies, the forging temperature, and particularly to the proper filling of forging dies to produce the desired metal density and correct flow lines.

A good gear forging must have maximum and uniform density. No scale or other foreign matter may be included. The forging should be so upset that the flow of material runs at right angles to the direction of stress the teeth will have to resist in service. This requires properly designed forging dies, a carefully proportioned block as sawed or sheared from the billet, and skillful hammer operation.

Rounded corners on a forged gear blank indicate that the die was incompletely filled under the hammer. They also tell us that blank density is non-uniform and below the required maximum. Machinability, in a blank of this kind, is considerably lower than with a sharp-cornered blank. Forging porosity not only reduces machinability, but it increases heat-treat distortion and cuts deeply into gear life and gear strength.

Cooperation between the forge shop and gear manufacturing operations which follow it is absolutely essential for efficient, high-quality production.

Heat-treat before machining

After forging and prior to machining, all gear blanks are given a special normalizing and annealing heat-treatment to remove residual stresses and to condition the metal for the machining processes. Thus the heat-treat department, too, becomes an important key to successful gear-making. All gears are heat-treated in batches with modern equipment closely controlled through temperature-recording instruments. The normalizing and annealing cycle requires up to 8 hr.

A Brinell hardness reading is taken on each forging, as it completes the cycle, at a spot ground on the rough forging before shot-blasting.

Hobbing and gear shaving are two of the more important gear manufacturing processes employed to produce quality gearing capable of complete interchangeability in multiple gear trains, and to provide the quietness so essential to automotive engines and similar mechanisms. Where required, gears are elliptoid crown-shaved to prevent edgeloading under heavy shaft deflection, thus promoting greater gear life and increased loadcarrying capacity.

Tool maintenance important

Many hundreds of hobs are carried in stock for the Barber-Colman and other makes of hobbing machines. All hobs are examined after use and before returning them to stores. Those requiring it are sharpened immediately. The same rule applies to the large stock of broaches maintained in the toolroom for round bores, splined bores, keyways, etc. These tools are supplemented with a suitable stock of the special circular cutters required for Red Ring gear finishing equipment.

As a case study of one of these interesting gear jobs, we have selected one of the gears which comprise the timing gear train of an automotive diesel engine.

Usually consisting of six gears, this timing gear train poses some neat problems. For one thing, each gear must be precision made to provide complete interchangeability for both original installation and for field service. As assembled and installed, the entire gear train must fit properly on gear centers, with specified backlash, and must be quiet under all operating conditions.

Specifications for the camshaft gear in this train are:

Dimensional	
No. of teeth	72
Dia pitch (DP)	8
Press angle (norm)	20°
Helix angle (RH)	22° 37' 11"
Pitch Dia (PD)	9.750 in.
Addendum	0.125 in.
Whole depth	0.280 in.
Manufacturing limits:	
Index, tooth-to-tooth	0.0003 in.
Accumulated index error	0.001 in.
Eccentricity (total indicator)	0.001 in.
Helix angle in 3 in.	0.001 in.
Backlash, mating gears	0.002 to 0.003

Gear material is A-4340-H alloy steel, normalized and annealed after forging. It is checked for Brinell, shot-blasted in a new Pangborn table-style machine, and is then ready for machining and gear cutting. Detail machining operations are: rough turn, turn, second turn, soft grind face, soft grind bore. Next, gear teeth are cut on a Barber-Colman hobber. They are cut 0.010 in. deeper than standard and with an allowance of 0.0025 to 0.003 in. for shaving.

Shaving procedure depends entirely upon the requirements of an individual job. In some cases gears are shaved in the green; in other cases they are shaved after hardening. This gear is shaped after oil-hardening to limits of R.31 to 35.

Following heat-treatment and hardening, the gear is returned to the shop for the second machining sequence: grind counterbore and faces; grind faces; elliptoid crown-shave gear teeth; file and burr; drill, ream, and countersink six $\frac{3}{8}$-in. holes.

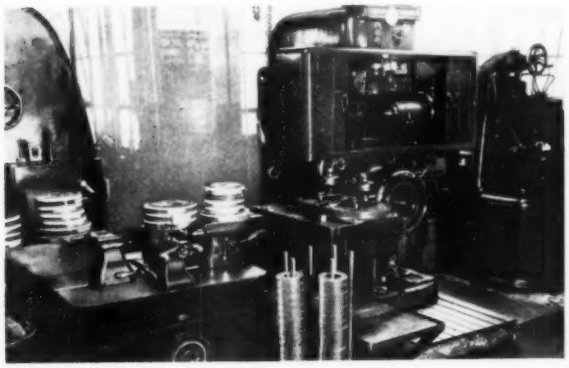
Elliptoid crown-shaving is done not only to prevent edge loading, but to control the tooth load pattern. The result is a long-lived gear train free of gear noise.

Typical shaving times on gears hardened to R.35 are:

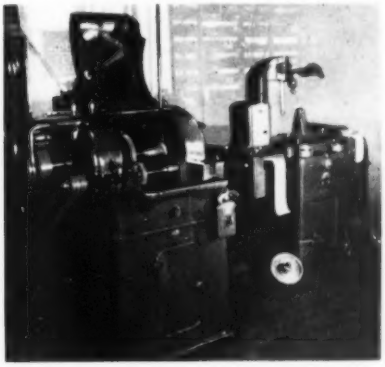
30 teeth,	8P, $\frac{7}{8}$-in. face	.... 4 min
36 "	8P, $1\frac{1}{4}$-in. face	.... 6 min
72 "	8P, $1\frac{1}{4}$-in. face	....12 min

Setup time is about 30 min. Feed for soft gears is 6.16 ipm at 198 rpm; for hard gears, 5.0 ipm at 179 rpm.

To assure quality control, there is a comprehensive gear laboratory which contains a variety of gear-checking equipment such as: Red Ring gear speeders for noise testing, a Fellows involute checking machine, surface-finish measuring devices, and lead testers.



Gears are checked dimensionally on the universal gear tester, left foreground. Those parts requiring rework are returned to the gear shaver or the lapping machine, which are placed convenient to the inspection setup

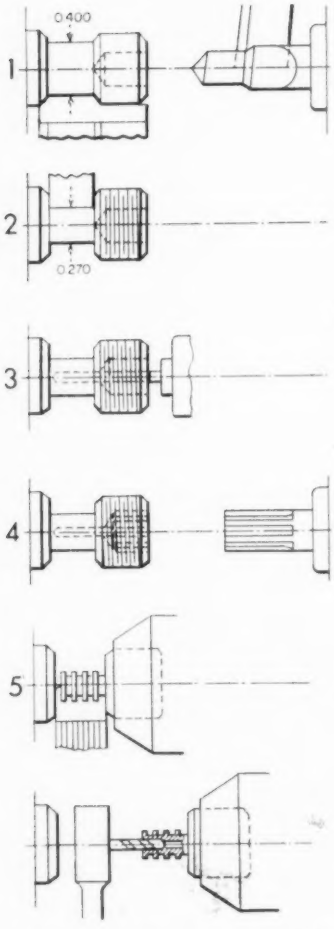


Additional inspections are performed on the sound testing machine, which measures noise produced by gears, and the involute checking machine, in the background to check tooth form

REVERSE TAPER THREADING PERMITS NEW TOOL LAYOUT IN WHICH...

Multi-Spindle Automatic Reduces Job Time 70%

Brass piece is made with large end outward in one setup on Davenport 5-spindle automatic



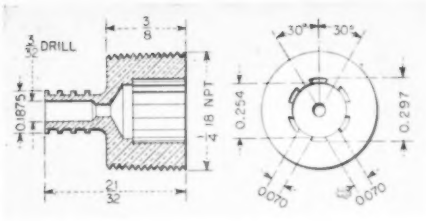
	OPERATIONS	TOTAL FEED	FEED PER REV.
1	Drill and face	3/8	0.0047
	Partial form	1/4	0.0017
2	Partial form	1/16	0.0013
	Thread reverse taper (Revolve diehead 1785 rpm)		
3	Stop spindle		
	Drill 0.043	11/32	0.0016
	(Revolve drill 5000 rpm)		
4	Stop spindle		
	Broach		
5	Form and cutoff (Piece held in pick-off spindle)	5/32	0.0039
	Counterbore left end (Piece held in pick-off spindle)	0.300	0.0038

Operations of special interest include: position 2, reverse taper threading; position 3, drilling 0.043-in. dia hole; position 4, broaching; position 5, pick-off and counterbore other end

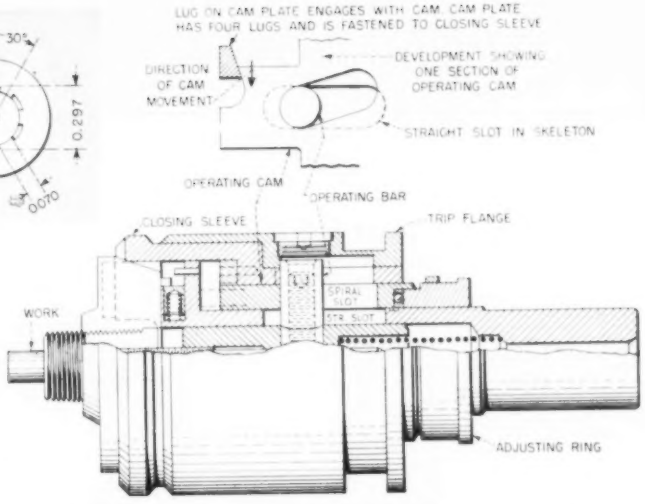
BY E. L. SAFFORD, Chief Tool Designer
The New York Air Brake Company
Watertown, N. Y.

FOUR second operations have been eliminated in an unusual multiple-spindle setup recently installed at the New York Air Brake Company, Watertown, New York. Production time is 70% less than the old method, and the danger of damage to the piece has been greatly reduced through the elimination of handling between machines and during the second operations. In addition, four second-operation machines now have open time for other work.

The piece is made from free-machining brass, and is produced with the large threaded section outward. As the thread is a taper, becoming smaller toward the small end of the piece, chasers in the diehead must converge as the thread is cut. This is done with a 9/16 Geometric KTR diehead recently developed for reverse taper threading, particularly on automatics where it is customary to rotate the diehead during threading. In this case, the diehead is driven at 1785 rpm in the same direction as the spindle to give an effective threading speed of approximately 120 fpm. As the diehead contracts the bar, a yoke attached to the machine acts on the external sleeve of the diehead. This causes the chasers to converge through the action of an internal cam. The diehead is pre-set to open when the end of the thread is reached and is closed by the yoke as the spindle withdraws.



Reverse-taper thread is cut in one pass with rotary diehead

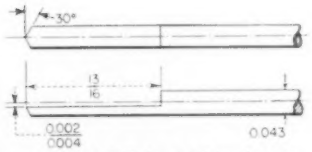

LUG ON CAM PLATE ENGAGES WITH CAM. CAM PLATE HAS FOUR LUGS AND IS FASTENED TO CLOSING SLEEVE
DIRECTION OF CAM MOVEMENT
DEVELOPMENT SHOWING ONE SECTION OF OPERATING CAM
STRAIGHT SLOT IN SKELETON
OPERATING CAM
OPERATING BAR
CLOSING SLEEVE
TRIP FLANGE
SPIRAL SLOT
WORK
ADJUSTING RING

Diehead is 9/16 Geometric KTR arranged so chasers converge to produce reverse taper. Yoke acts on sleeve, causing internal cam to produce necessary converging action as diehead travels along bar

Eliminates Second Operations

Because of reverse-taper threading, it now is possible to drill the 0.254-in. diameter hole (position 1) and broach the locating grooves (position 4) in the automatic setup. Previously, the piece was made with the small end outward, and the threads were cut in the conventional manner. The 0.254-in. hole was produced on a drill-press and broaching was done in a small power press. An operation to remove broaching chips then was needed. This operation is not required on pieces broached on the automatic, as the rotation of the bar and the pressure of the coolant flushes all chips from the piece.

The fourth operation that formerly was performed in a separate setup is the counterboring of the 3/32-in. hole in the small end of the piece. This now is done in the automatic setup with a power-rotated pickoff spindle at the fifth position and a cam-actuated swinging arm that holds the counterbore. The pickoff spindle, which rotates at the same speed as the bar, advances to grip the piece and support it during cut-off and the final forming of the grooves. A spring collet in the spindle grips the threaded section of the piece, the collet being closed by a special cam. After the piece is cut off, the pick-off spindle drops back and the arm holding the 3/32-in. drill swings down in line with the piece. The pickoff spindle then feeds forward to counterbore the 3/32-in. hole in the small end of the piece. The pickoff spindle next moves back to its extreme position, where the special cam opens the collet and a spring-loaded knock-out ejects the piece.



Special flat drill for 0.043-in. dia hole is ground with cutting edge 0.002 in. below centerline of drill. Drill is HSS, hardened and ground

Gives Short Job Cycle

Other interesting features of the tool layout include division of the forming operation and selection of flat drills for the job. Division of the forming required on the small end of the piece holds down the total number of revolutions required for each spindle at which forming is done, so this operation does not delay the job cycle. Furthermore, a sturdy section of bar remains until all other operations are complete. It is only at the fifth position that the bar is formed down to its 0.156 in. diameter and, at this point, it is supported by the pick-off spindle.

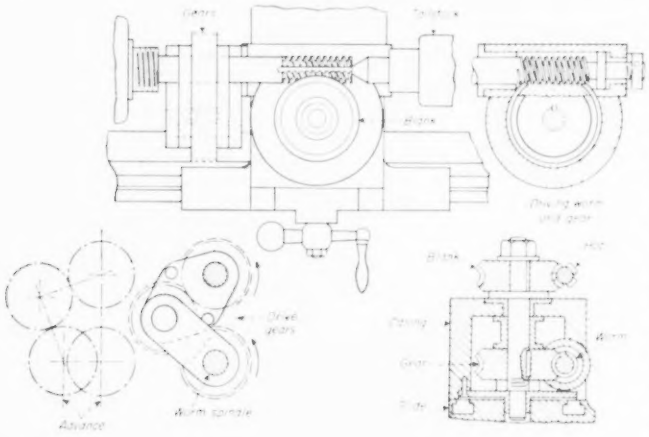
At the first and third positions, flat drills are employed. With the flat drills, chips clear without packing, thus reducing the danger of drill breakage and of interruption of the automatic cycle.

Developed in cooperation with the Davenport Machine Tool Company, this job is run in a five-spindle Davenport, and has a 4.4 sec cycle. Gross production is 818 pc/hr.

HOW THE DIEHEAD WORKS

As the diehead contacts the work, an operating yoke, controlled by stops on the machine, stops the forward motion of the trip flange. As the ends of the operating bar engage the trip flange, the operating bar also stops its forward motion. With the continued forward motion of the diehead, however, the operating bar acts on a spiral slot in the operating cam, causing the cam to rotate. The forward surfaces of the cam are inclined and coupled with the closing sleeve in such way that the sleeve advances causing the chasers to converge. By a change in operating cam, straight threads or conventional taper threads also can be cut with this diehead.

Practical Ideas



Flexible Gearing Linkage Operates Lathe Hobber

OUR FIRST METHOD of producing a large batch of worm gears was to gash them on a miller, then finish them on a lathe. The setup located the gear on a free vertical spindle on the lathe carriage so the hob would rotate the gear as it cut. The hob was between centers, and was driven by the lathe headstock.

This worked satisfactorily, but was slow. We decided to try gashing the gears on the lathe, for which we had to rig some way of driving the gears positively and some method of feeding the gears into the hob.

The normal compound rest was removed from the lathe, and a worm drive housed in a casing was substituted for it on the carriage. The worm gear was a duplicate of the one to be cut, and the worm matched it. Three gears with minimum backlash and equal size were mounted to drive the auxiliary worm from the hob arbor. These were assembled between two sets of arms, which allowed the gears to move when the slide was advanced or retracted, but prevented them from disengaging. Of course the carriage would not have to be traversed once the gear blank was centered opposite the hob.

When the lathe is switched on, the headstock revolves the hob, and the gear on the hob arbor drives the idler gear and the gear in the worm housing. This operates the worm inside the housing at the same speed as the hob, which rotates the gear blank at the right speed for the hob. Advancing the slide works the gear blank into the hob, which cuts the teeth.

The hob could be operated at a high rate of speed, so production was high and economical. *Tom Brown, Perivale, England.*

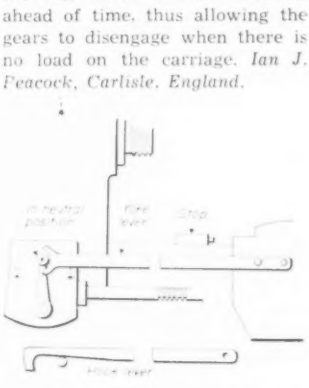
Traversing Trips Automatize Bench Lathe

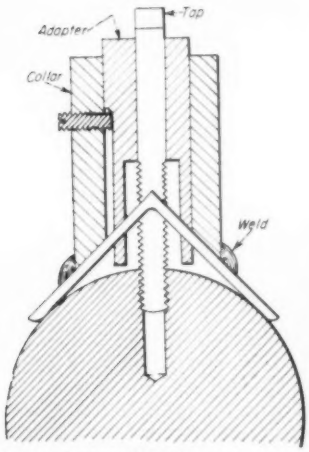
MANY SMALL BENCH LATHES have powered leadscrews, rotated from a gearbox at the headstock, and controlled by a simple lever on the box. However, most of them do not have provision for leadscrew trips to stop carriage movement automatically. If the gearbox lever is moved to the right to stop carriage movement to the left, and vice versa, a couple of simple levers can stop the carriage.

One lever, for use when you are feeding to the left (toward the headstock), is made with a yoke end. It is screwed to the carriage, and is located to push the gearbox lever to the out-of-engagement position when the carriage has moved the tool almost to the end of the cut. About 1/16 in. of leeway should be allowed, because backlash in the mechanism of the lathe will not permit perfect stopping to any high accuracy. For this reason, a fixed stop should be provided, and the last bit of the cut should be done by hand.

A second lever can be attached for action when you are feeding to the right. It is pivoted on a single screw, and is allowed to ride on top of the gearbox lever. A hook end will engage the lever and pull it to stop the carriage in the same way. Naturally, the lever lengths must be adjusted for each new setup.

On small-batch operation, where cut lengths are short, a single operator can handle three lathes equipped this way. Normally, this method should only be utilized for light cuts because the feed is gradually disengaged. For heavy cuts, the shoulder toward which the tool works can be undercut ahead of time, thus allowing the gears to disengage when there is no load on the carriage. *Ian J. Peacock, Carlisle, England.*

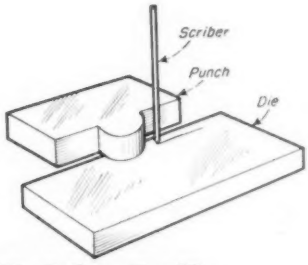




Tap Aligner Works On Round Stock, Too

I NOTICED in a recent issue of AMERICAN MACHINIST a device for aligning a tap square with a flat piece of stock. Why not make one that will center a tap squarely over a hole through a piece of round stock? If it is carefully planned, it can be used on both flat and round stock.

The aligner can be made of angle iron, with the tap-aligning collar and adapter fitted on to hold the tap through the center. If the legs of the angle are machined off to the same size, the device will still work on flat stock. *Troy H. Main, Bartlesville, Okla.*

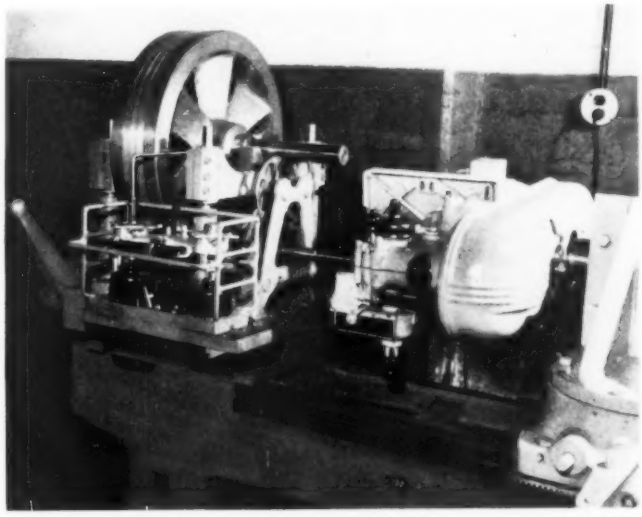


Die Scribers Simplify Layout to Duplicate Punch

HAVING TO MAKE a number of simple bending tools recently, I looked for a shortcut method of making the die just the same as the punch, plus the required thickness of material.

The result was a number of special scribers. If the material is 0.0625 in. thick, for example, I take a 0.125-in. steel rod and point the end on dead center. Then, holding the scriber vertical, I scribe around the punch onto the die. The resulting curve is just what I want.

The scriber must be twice the thickness of the material, and must be held vertically to make the layout accurate. *Aubrey F. Wilson, London, England.*



Balancing Machine Made from Turret Lathe and Drill

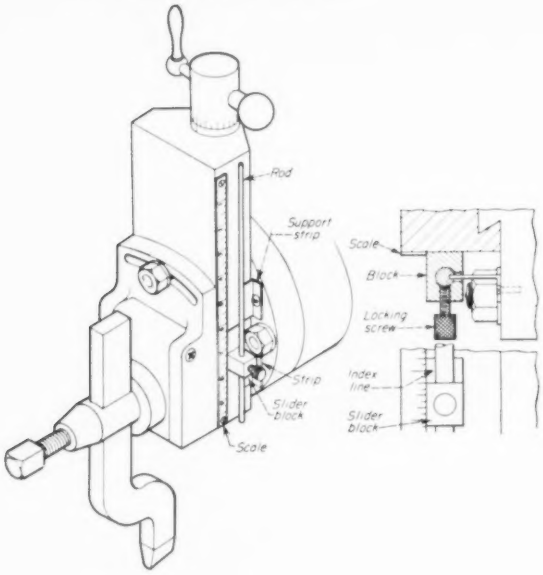
OUR OLD METHOD of balancing V-belt sheaves took a lot of time. First, we had to place the sheave on a balancing arbor, check the balance with mud, then weigh the mud. Then we had to drill out metal to equal the mud, and then check the balance. Often, a second drilling job had to be done. The whole procedure required about 30 min per sheave.

Our new balancing rig does the same job on only 10 min, and does it within half an ounce or better, which is close enough for speeds up to 1400 rpm.

An old turret-lathe bed is the mount for the machine. A 17-in. Delta drillhead is on the carriage, where it can be shifted up and down, and in and out for different sheave sizes. There is a V-block lifting assembly that raises the balancing arbor for the times when the sheaves are being drilled. This protects the balancing rolls and allows the sheaves to be drilled without danger of slippage. When drilling, the sheaves are also held by a backup block at the rear of the machine.

For a given sheave, a hole is drilled and a plug of weight equal to the weight of the chips is inserted. A scale on the front of the machine indicates the change in balance due to the hole, and a chart indicates the number and depth of holes that must be drilled to counteract the total unbalance indicated by the scale when the plug is inserted in the test hole.

Any sheave with an OD from 12 to 20 in., and a width from 2 to 6½ in. can be handled. *W. R. Hufendick, Quincy, Ill.*

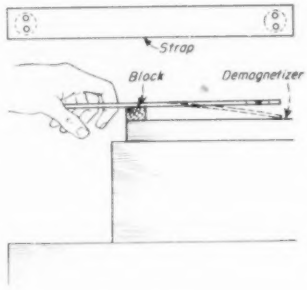


Shaper Slider Indicates Tool Feed

SHAPER OPERATORS always want to know the thickness of the work and just how far their cuts have gone through the work. This indicator will tell them.

A steel scale is mounted on the toolslide. It should be vertical, close to the rear edge of the slide, and located with the zero end up. A steel rod of the same length as the scale is then mounted by means of sheet-metal strips next to the scale, but supported from the fixed part of the head. A slider block, equipped with a locking screw, is added to the rod. The block is slotted to clear the support strips that are soldered to the rod.

The original thickness of the work is noted, and the top edge of the slider block is set to this dimension on the scale. Now, if a quarter of an inch must be taken off the work, the operator makes cuts until the slider indicates that the head (and scale) have moved down to 2¼ in. If possible, the micrometer dial of the head may be correlated with the scale to give continuous, accurate readings. It can be done if the dial has an adjustable scale. *Tom Brown, Perivale, England.*



Demagnetizer Table Inspects Rubber Straps

WE HAVE BEEN supplying a molding company with steel washers imbedded in rubber straps, each washer having two holes drilled and tapped in it. Our customers assemble screws into the washers, and attach the assemblies to their products. Unfortunately, the rubber virtually covers both sides of the washer, so all that can be seen is the two holes. Therefore, inspection to make sure each rubber strap had two washers in it was difficult.

We solved the problem by rigging an electric demagnetizer on a table, adding a wooden block, and placing each strap over the block. If the washer was present, the end of the strap was pulled down on the magnetizer table. If not, the strap just hung there, balanced on the block.

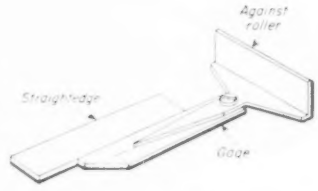
This inspection idea proved quick and easy, and eliminated the difficult visual job of probing for the washers to make sure they were there. *Fred Lettino, Astoria, N.Y.*

Roll-Feed Gage Indicates Squareness

CONSIDERABLE TROUBLE can be encountered when a set of dies have to be aligned with a roll feed. This gage is helpful.

The gage itself has a pivot, on which a bent angle and a marked straightedge blade work. A separate straightedge blade is inserted in the die stripper, or may be held against the edge of the stripper; while the bent angle on the gage is held against one of the rollers. The two straightedges are matched together, and the pointed end of the angle piece will indicate squareness if it lines up with the index mark on the straightedge.

This will indicate that the rollers are square with the stock-feed channel and the roll feed is set up correctly. Any misalignment will be indicated by the pointer, and can be corrected. *J. Henry Garneau, Vedun, Que.*



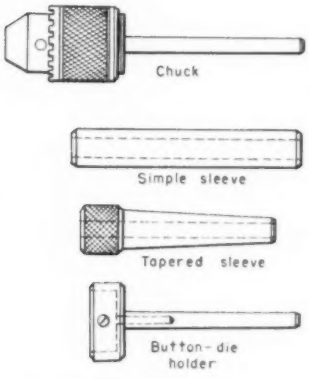
Small Holes Drilled With Tailstock Sleeve

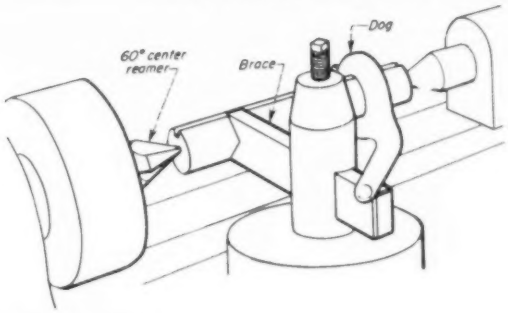
VERY SMALL HOLES can be drilled and tapped, and small-diameter round stock can be externally threaded, if a sleeve arrangement is utilized in the tailstock spindle of the lathe.

First, a small drill chuck is fitted with a straight shank. This must be trued and checked to make sure it rotates the work exactly on center and with no wobble. Next, a simple sleeve can be made to carry the shank of the drill. The sleeve must also be straight and true, and must be accurately bored or drilled and reamed. This job can be done from the lathe headstock for best accuracy. The straight sleeve can be chucked in the tailstock; then the straight-shank chuck can be mounted to hold the tool.

For more accuracy, although you lose convenience and economy, a tapered sleeve can be made to fit directly into the spindle of the tailstock. This must be accurately fitted to take the drill shank, and may have a knurled head to aid in inserting and removing it from the tailstock.

External threading is done with a straight-shank adapter made to hold a button die, just as the other shank supported the chuck. However, in this case the adapter is made so the die will be held inside a carefully bored hole, and will be clamped with a setscrew. *Jack Harris, Long Island City, N. Y.*



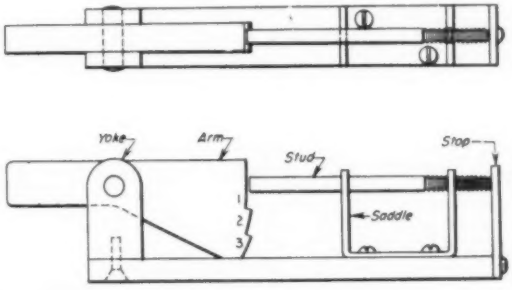


Toolpost Feed Corrects Bad Centers

WHEN CENTERS cut in shaft ends are not concentric, a good way to correct them is to chuck a 60° countersink or center reamer, mount the work between this tool and the tailstock center, then add a toolpost V-notched brace to press against and support the side of the work.

A dog is added to the work to prevent rotation. After a check of the work between bench centers, during which the heavy side is marked, the toolpost support is advanced to push the work against the rotating countersink; thus shifting the centerhole.

Centers in hardened shafts can be corrected this way, but with a 60° soft center instead of the countersink. Grinding compound added to the center does the cutting. *Joseph A. Wagner, Sioux City, Iowa.*

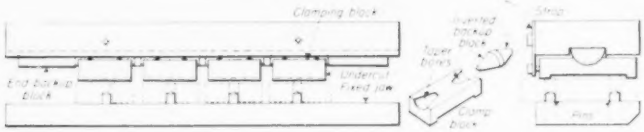


Stepped Gage Classifies Studs

WE HAD a large batch of studs to be machined further. They varied a lot in length; and though this had no bad effect on the product, it made the machining operations difficult. To separate them into three length groups to simplify our machining setup, we had this gage made.

On a simple flat base, a yoke was assembled to pivot a stepped arm. This was the gage arm, and was marked off to indicate the class of length each stud fell into. A fixed stop was mounted on the other end of the plate, and a yoke or saddle was added between these parts to support the studs singly.

By loading a stud, pushing to the fixed stop, and operating the gage arm, we could get a quick check on the relative size. *L. Kasper, Philadelphia, Pa.*

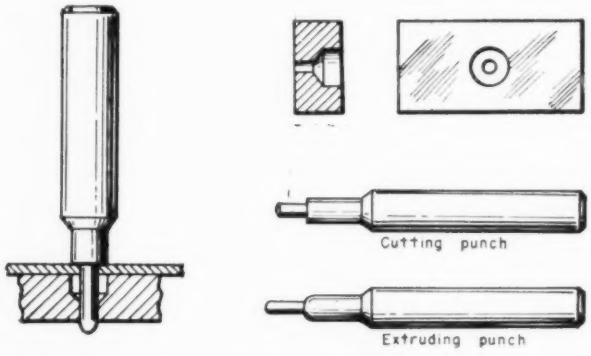


Gang Vise Equalizes Small Parts

WHEN SMALL PIECES must be held in a vise for gang milling, slight inaccuracies or irregularities can ruin the setup unless a compensating vise is utilized. This vise does the job by means of shifting blocks.

The stationary jaw has fixed pins, which locate the workpieces by means of two holes in each part. The movable vise jaw is equipped with a set of clamping blocks, each undercut on the clamping face so it will bear against the work only at the two ends. These blocks are taper-bored at their ends to provide slanted, curved surfaces which will match the backup blocks inside the jaw assembly. To prevent the clamp blocks from falling out of the vise, they are loosely suspended from the main movable jaw by small straps and screws.

The backup blocks, which are located in a groove cut in the movable jaw, are taper-turned on both ends to match the grooves in the ends of the clamp blocks. Two of these blocks—at the ends of the vise paw—are foxed, but the others can shift to equalize the clamping load against the work. All pieces will be gripped firmly when the vise jaws are tightened. *Robert Mery, Farmingdale, N.Y.*



Thin-Stock Punch Cuts Clean Holes

HOLES CAN BE ENLARGED in thin sheet or strip stock with a punch that works through a pilot hole in the stock into a recessed die. The sketch shows equipment used for enlarging 0.0625-in. holes to 0.125 in.

The die is drilled for the pilot that is formed on the punch, and is recessed for the OD of the punch. The shoulder between the two holes can be left just as drilled.

The punch is ground down from a larger diameter to form the 0.125-in. OD and the 0.0625-in. OD. For punching, the shoulder is cut square, but the same kind of tool can be rounded off to a radiused shoulder to form an extruding punch, which will form a round nub in the stock. *Jack Harris, Long Island City, N. Y.*

$25 *In addition to regular payment*

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

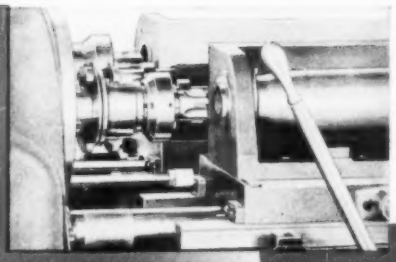
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

137th Winner:

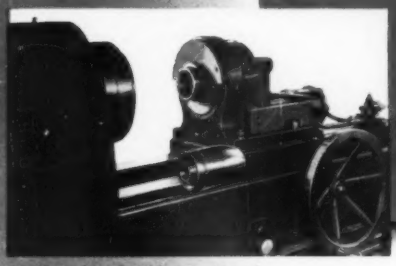
(For September 17 issue)

G. D. Carlsen

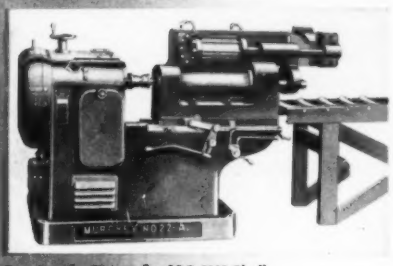
Scribed Lines Pilot Drill



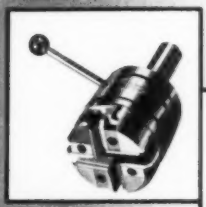
Tapping Two 75 MM Shells on a Murchey Double Mount Shell Tapper using "L" Taps

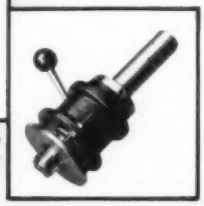


Murchey Thread Mill for Gun Barrels, Rocket Tubes and Breech Blocks



Tapping the Nose of a 105 MM Shell





Murchey Self-Opening Die Head and Collapsible Tap

THESE

Murchey Veterans

again in active service

ON DEFENSE PRODUCTION

These Murchey Threading Machines are ideally engineered for threading the components of guns and ammunition at maximum production rates and minimum costs. Their service record during the last war was outstanding. Now they are going back into active service on the same products.

When used with Murchey self-opening die heads and collapsible taps the combination affords several important advantages—

1. *Quickest job changeover.*
2. *More threads between chaser regrinds.*
3. *Longer chaser and tool service life*
4. *Equalized chaser wear.*
5. *Less tool inventory.*
6. *Lower tool replacement costs.*
7. *Quicker tool adjustment.*
8. *Just one minute to replace chasers.*

If you are getting ready for defense work involving threading, get the suggestions of a Murchey Division engineer. He may be able to save you valuable time.

Lower Cost per Thread

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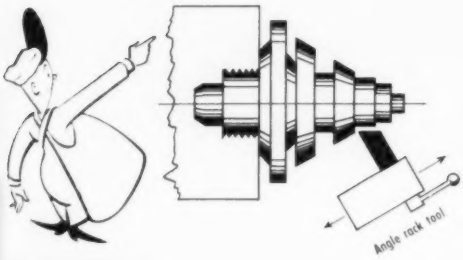
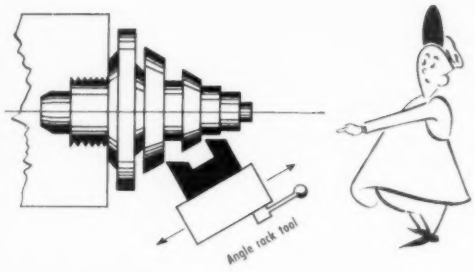
Easy does it if you know how says Stainless Sam



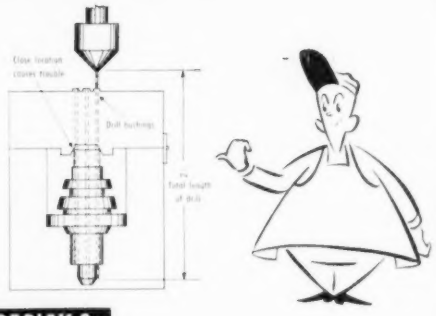
PROBLEM 1:

A shop was turning nozzles for paint-spray equipment from Type 303 in $^{15}/_{16}$" hex bars. The job had to be done on a light bench lathe. An interrupted taper was being turned with a single-point tool on a rack slide. Result was that taper was not constant. Diameters of stages varied and part would not fit atomizer head properly.



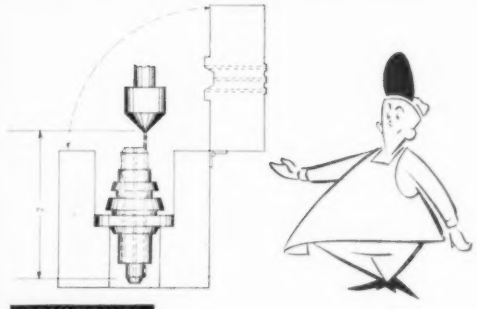
SOLUTION 1:

Stainless Sam solved this problem by using a double adjustable tool which cut both tapered surfaces simultaneously. This reduced travel of rack slide, duplicated uniformly the taper in both stages, speeded operation and increased tool life.



PROBLEM 2:

Another operation on this spray nozzle consisted of drilling four $^{1}/_{16}$" through holes, 1-$^{1}/_{4}$" deep. The drill had to start on a sloped surface, so guide bushings were necessary. Extra long drills were also required. Because chips could not work out of the long bushings and the drill was forced to cut chips, drills broke down rapidly.



SOLUTION 2:

Stainless Sam suggested that the operator spot the holes through the drill bushings about $^{1}/_{8}$" deep with a standard drill. Then the bushing plate is swung out of the way and holes are finish-drilled without use of bushings. This aids in chip disposal, permits use of shorter drill and helps prolong drill-life.

Latest stainless machining practices are discussed at length in Armco's 1951 edition of the booklet "Machining of Armco Stainless Steels." Write for your copy today. The speeds, feeds and tooling recommended will help you machine stainless steels readily with standard equipment.

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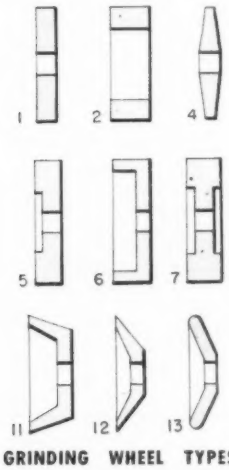
American Machinist

Maximum Grinding-Wheel Speeds

Courtesy Bay State Abrasive Products Company.

PERIPHERAL SPEEDS FOR VARIOUS TYPES OF WHEELS, Fpm

WHEEL TYPES	VITRIFIED BONDS			RESINOID BONDS		
	SOFT (Low strength)	MEDIUM (Medium strength)	HARD (High strength)	SOFT (Low strength)	MEDIUM (Medium strength)	HARD (High strength)
Types 1 and 4	5,500	6,000	6,500	6,500	8,000	9,500
Types 5 and 7	5,500	6,000	6,500	6,500	8,000	9,500
Type 2	4,500	5,500	6,000	6,000	8,000	9,500
Types 11, 12 and 13	4,500	5,500	6,000	6,000	8,000	9,500
Type 6	4,500	5,000	5,500	6,000	7,500	9,000
Cut-off wheels larger than 16 in.						7,500 to 14,000
Cut-off wheels 16 in. and smaller						10,000 to 16,000
Automotive and aircraft crank grinding		6,000 to 7,300	6,500 to 8,500			
Automotive and aircraft cam grinding	5,500	6,000 to 8,000	6,500 to 8,500			
Reinforced cut-off 3/8 in. and thicker				9,500	9,500	9,500
Reinforced cut-off under 3/8 in. thick				12,000	15,000	16,000
Reinforced-hub disk under 1/4 in. thick				11,000	11,000	13,000
Reinforced-abrasive disk 1/8 in. thick				10,000	10,000	10,000



GRINDING WHEEL TYPES

WHEEL RPM TO OBTAIN DESIRED PERIPHERAL SPEED, Surface Ft per Min.

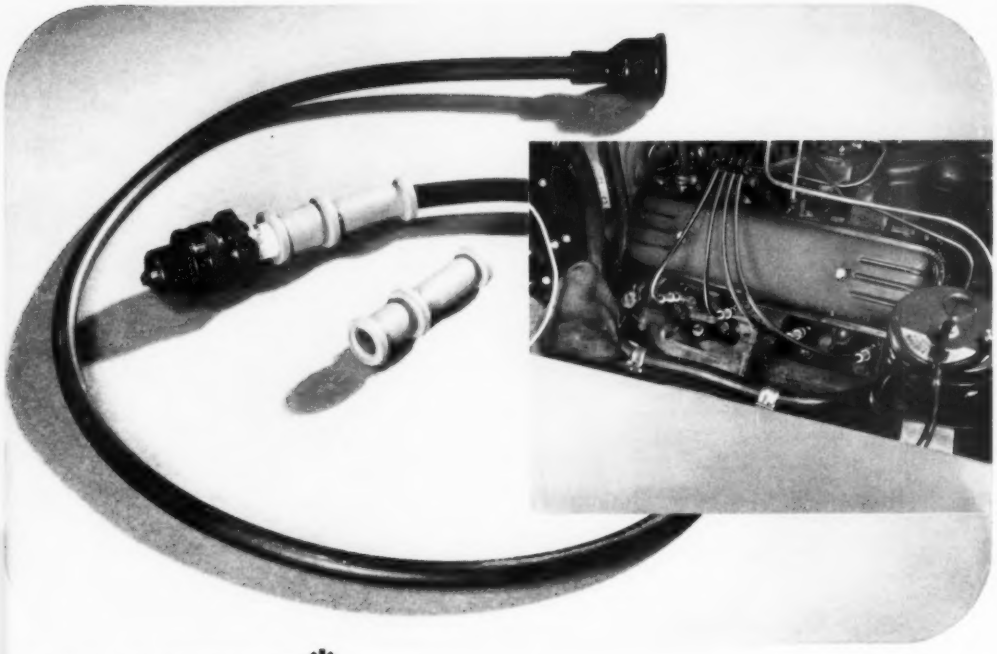
DIA. IN.	4,500	5,000	5,500	6,000	6,500	8,000	9,500	10,000	12,000	13,000	16,000
2	8,595	9,550	10,505	11,460	12,415	15,280					
3	5,730	6,370	7,000	7,645	8,280	10,185	12,115	12,730	15,280	16,550	20,370
4	4,300	4,775	5,250	5,730	6,210	7,640	9,070	9,550	11,460	12,415	15,280
5	3,440	3,820	4,200	4,585	4,970	6,110	7,260	7,640	9,170	9,930	12,225
6	2,865	3,185	3,505	3,820	4,140	5,090	6,050	6,365	7,640	8,275	10,185
7	2,455	2,730	3,000	3,275	3,550	4,365	5,185	5,455	6,550	7,095	8,730
8	2,150	2,390	2,625	2,865	3,105	3,820	4,535	4,775	5,730	6,205	7,640
9	1,910	2,125	2,335	2,545	2,760	3,395	4,030	4,245	5,095	5,515	6,790
12	1,435	1,590	1,750	1,910	2,070	2,545	3,025	3,185	3,820	4,140	5,095
14	1,230	1,365	1,500	1,635	1,775	2,180	2,590	2,730	3,275	3,545	4,365
18	955	1,060	1,165	1,275	1,380	1,700	2,015	2,120	2,545	2,760	3,395
20	860	955	1,050	1,145	1,240	1,530	1,815	1,910	2,290	2,480	3,055
24	715	795	875	955	1,035	1,275	1,510	1,590	1,910	2,070	2,545
30	575	635	700	765	830	1,020	1,210	1,275	1,530	1,655	2,035
36	475	530	585	635	690	850	1,005	1,060	1,275	1,380	1,695
42	410	455	500	545	590	725	865	910	1,090	1,180	1,455

NOTES:

Consult wheel manufacturer for recommended speed, when using wheels of unusual or extreme shapes, such as deep cups with thin walls or backs, long drums or large center holes.

Maximum speeds given are based on strength of the wheels and not on cutting efficiency. Best speeds may sometimes be considerably lower.

Do not exceed a peripheral speed recommended and approved by the wheel manufacturer, even though it is lower than shown.



SILASTIC* boots plug ignition leaks!

It's no longer a trade-secret that some of the leading automobile manufacturers are using Silastic boots to plug ignition leaks. Molded of Silastic 250, these spark plug boots exclude moisture; remain flexible for an indefinitely long period of time at sub-zero temperatures and at operating temperatures in the range of 400° - 450°F. They withstand hot oil and they keep a spark at 27,000 to 40,000 volts from jumping over the outside of the plug.

These are the properties of Silastic that make engines easy to start even on a wet morning. And these are the properties that start engineers to work simplifying the design and increasing the service life of hot air shut-off valves, transmission systems, cooling fins on aircraft engines, anti-icing systems, traction motors, transformers and cable. You can do extraordinary things with Silastic, the Dow Corning silicone rubber that retains its properties over a temperature span of more than 600 degrees from —100° to +500°F.

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Transmission Roller Chain—III

Continued from Nov. 12 American Machinist

CHAIN LENGTHS FOR 2-WHEEL DRIVES

A number of formulae have been developed to obtain the length of chain on 2-wheel drives, but usually they involve more labor than that of making a careful layout to scale, or double size, and stepping off with accurately spaced dividers. In any case, it is recommended that such layouts be given careful study, to provide proper ratios, ample adjustment, etc., and that they be submitted to the chain manufacturer for recheck and approval.

The following method may be used for accurately determining the chain lengths of 2-wheel drives:

Subtract diameter of smaller sprocket from diameter of larger sprocket, and divide the difference by twice the center distance (in inches). Find in Column *A*, Table 2, the value next larger than this result, to use as an index figure. The corresponding values (in same line) from columns *B*, *C* and *D*, should be substituted in following formula:

Length of chain equals the sum of:

Value *B* multiplied by center distance; plus

Value *C* multiplied by number of teeth in smaller wheel, and by pitch; plus

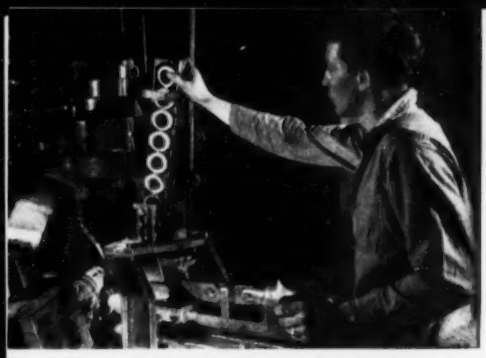
Value *D* multiplied by number of teeth in larger wheel, and by pitch.

HORSEPOWER RATINGS OF SINGLE-STRAND CHAIN

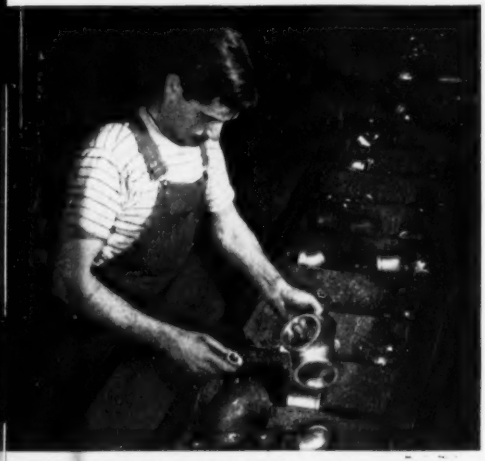
The horsepower rating tables have been established on a life expectancy of approximately 15,000 hr under optimum drive conditions and a service factor of one (1). Principles and serv-

Table 2—VALUES FOR LENGTH OF CHAIN

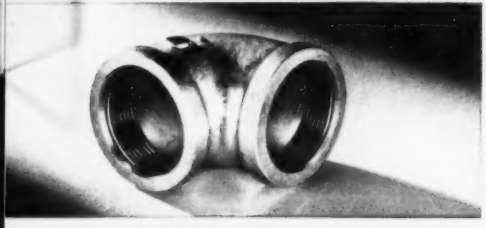
A	B	C	D	A	B	C	D	A	B	C	D
.00000	2.0000	.5000	.5000	.26303	1.9296	.4153	.5847	.50754	1.7233	.3305	.6695
.00436	2.0000	.4986	.5014	.26724	1.9273	.4139	.5861	.51129	1.7188	.3292	.6708
.00873	1.9999	.4972	.5028	.27144	1.9249	.4125	.5875	.51504	1.7143	.3278	.6722
.01309	1.9998	.4958	.5042	.27564	1.9225	.4111	.5889	.51877	1.7098	.3264	.6736
.01745	1.9997	.4944	.5056	.27983	1.9201	.4097	.5903	.52250	1.7053	.3250	.6750
.02181	1.9995	.4931	.5069	.28402	1.9176	.4083	.5917	.52621	1.7007	.3236	.6764
.02618	1.9993	.4917	.5083	.28820	1.9151	.4070	.5930	.52992	1.6961	.3222	.6778
.03054	1.9991	.4903	.5097	.29237	1.9126	.4056	.5944	.53361	1.6915	.3208	.6792
.03490	1.9988	.4889	.5111	.29654	1.9100	.4042	.5958	.53730	1.6868	.3194	.6806
.03926	1.9985	.4875	.5125	.30071	1.9074	.4028	.5972	.54097	1.6821	.3180	.6820
.04362	1.9981	.4861	.5139	.30486	1.9048	.4014	.5986	.54464	1.6773	.3166	.6834
.04798	1.9977	.4847	.5153	.30902	1.9021	.4000	.6000	.54829	1.6726	.3153	.6847
.05234	1.9972	.4833	.5167	.31316	1.8994	.3986	.6014	.55194	1.6678	.3139	.6861
.05669	1.9968	.4819	.5181	.31730	1.8966	.3972	.6028	.55557	1.6629	.3125	.6875
.06105	1.9963	.4806	.5194	.32144	1.8939	.3958	.6042	.55919	1.6581	.3111	.6889
.06540	1.9957	.4792	.5208	.32557	1.8910	.3944	.6056	.56280	1.6532	.3097	.6903
.06976	1.9951	.4778	.5222	.32969	1.8882	.3931	.6069	.56641	1.6483	.3083	.6917
.07411	1.9945	.4763	.5237	.33381	1.8853	.3917	.6083	.57000	1.6433	.3069	.6931
.07846	1.9938	.4750	.5250	.33792	1.8824	.3903	.6097	.57358	1.6383	.3055	.6945
.08281	1.9931	.4736	.5264	.34202	1.8794	.3889	.6111	.57715	1.6333	.3042	.6958
.08716	1.9924	.4722	.5278	.34612	1.8764	.3875	.6125	.58070	1.6282	.3028	.6972
.09150	1.9916	.4708	.5292	.35021	1.8733	.3861	.6139	.58425	1.6231	.3014	.6986
.09585	1.9908	.4694	.5306	.35429	1.8703	.3847	.6153	.58779	1.6180	.3000	.7000
.10019	1.9899	.4681	.5319	.35837	1.8672	.3833	.6167	.59131	1.6129	.2986	.7014
.10453	1.9890	.4667	.5333	.36244	1.8640	.3819	.6181	.59482	1.6077	.2972	.7028
.10887	1.9881	.4653	.5347	.36650	1.8608	.3806	.6194	.59832	1.6025	.2958	.7042
.11320	1.9871	.4639	.5361	.37056	1.8576	.3792	.6208	.60182	1.5973	.2945	.7055
.11754	1.9861	.4625	.5375	.37461	1.8544	.3778	.6222	.60529	1.5920	.2932	.7068
.12187	1.9851	.4611	.5389	.37865	1.8511	.3764	.6236	.60876	1.5867	.2917	.7083
.12620	1.9840	.4597	.5403	.38268	1.8478	.3750	.6250	.61222	1.5814	.2903	.7097
.13053	1.9829	.4583	.5417	.38671	1.8444	.3736	.6264	.61566	1.5760	.2889	.7111
.13485	1.9817	.4569	.5431	.39073	1.8410	.3722	.6278	.61909	1.5706	.2875	.7125
.13917	1.9805	.4555	.5445	.39474	1.8376	.3708	.6292	.62251	1.5652	.2861	.7139
.14349	1.9793	.4542	.5458	.39875	1.8341	.3694	.6306	.62592	1.5598	.2847	.7153
.14781	1.9780	.4528	.5472	.40275	1.8306	.3681	.6319	.62932	1.5543	.2833	.7167
.15212	1.9767	.4514	.5486	.40674	1.8271	.3667	.6333	.63271	1.5488	.2819	.7181
.15643	1.9754	.4500	.5500	.41072	1.8235	.3653	.6347	.63608	1.5432	.2805	.7195
.16074	1.9740	.4486	.5514	.41469	1.8199	.3639	.6361	.63944	1.5377	.2792	.7208
.16505	1.9726	.4472	.5528	.41866	1.8163	.3625	.6375	.64279	1.5321	.2778	.7222
.16935	1.9711	.4458	.5542	.42262	1.8126	.3611	.6389	.64612	1.5265	.2764	.7236
.17365	1.9696	.4444	.5556	.42657	1.8089	.3597	.6403	.64945	1.5208	.2750	.7250
.17794	1.9681	.4430	.5570	.43051	1.8052	.3583	.6417	.65276	1.5151	.2736	.7264
.18224	1.9665	.4416	.5583	.43445	1.8014	.3569	.6431	.65606	1.5094	.2722	.7278
.18652	1.9649	.4403	.5597	.43837	1.7976	.3556	.6444	.65935	1.5037	.2708	.7292
.19081	1.9633	.4389	.5611	.44229	1.7937	.3542	.6458	.66262	1.4979	.2694	.7306
.19509	1.9616	.4375	.5625	.44620	1.7899	.3528	.6472	.66588	1.4921	.2680	.7320
.19937	1.9599	.4361	.5639	.45010	1.7860	.3514	.6486	.66913	1.4863	.2667	.7333
.20364	1.9581	.4347	.5653	.45399	1.7820	.3500	.6500	.67237	1.4804	.2653	.7347
.20791	1.9563	.4333	.5667	.45787	1.7780	.3486	.6514	.67559	1.4746	.2639	.7361
.21218	1.9545	.4319	.5681	.46175	1.7740	.3472	.6528	.67880	1.4686	.2625	.7375
.21644	1.9526	.4306	.5694	.46561	1.7700	.3458	.6542	.68200	1.4627	.2611	.7389
.22070	1.9507	.4292	.5708	.46947	1.7659	.3445	.6555	.68518	1.4567	.2603	.7397
.22495	1.9487	.4278	.5722	.47332	1.7618	.3431	.6569	.68835	1.4507	.2583	.7417
.22920	1.9468	.4264	.5736	.47716	1.7576	.3417	.6583	.69151	1.4447	.2569	.7431
.23345	1.9447	.4250	.5750	.48099	1.7535	.3403	.6597	.69466	1.4387	.2556	.7444
.23769	1.9427	.4236	.5764	.48481	1.7492	.3389	.6611	.69779	1.4326	.2542	.7458
.24192	1.9406	.4222	.5778	.48862	1.7450	.3375	.6625	.70091	1.4265	.2528	.7472
.24615	1.9385	.4208	.5792	.49242	1.7407	.3361	.6639	.70401	1.4204	.2514	.7486
.25039	1.9363	.4194	.5806	.49622	1.7364	.3347	.6653	.70711	1.4142	.2500	.7500
.25460	1.9341	.4181	.5819	.50000	1.7321	.3333	.6667				
.25882	1.9319	.4167	.5833	.50377	1.7277	.3320	.6680				



A PIPE FITTING MANUFACTURER had trouble with a straight cutting oil. It made the floors slippery; was suspected of causing skin irritations; discolored the fittings. In addition, a special cleaner and rust preventive had to be used.



CHANGING TO S.E.C.O. brought excellent results. This "Job Proved" emulsifying cutting oil kept the fittings from discoloring, minimized complaints about skin troubles, made floors safe, eliminated the need for a special cleaner and rust preventive.



OPERATIONAL DATA. Machine: 2" automatic tapping machine • Metal: Malleable iron • Operation: Thread and chamfer 1½" 45° elbow • Cutting Speed: 75 SFM • Tools: High speed • Production: 306 pieces per hour • Cycle Time: 11¾ sec.

S.E.C.O. REPLACES THREE PRODUCTS; REDUCES COSTS, MAKES SHOP CLEANER, SAFER

Ten years ago, one of the largest manufacturers of pipe fittings was using a straight cutting oil that proved to be a production headache. It made floors slippery, discolored the fittings, even was blamed by the operators for causing skin ailments.

The company overcame these problems—with extra benefits for good measure—by changing to Sunoco Emulsifying Cutting Oil. S.E.C.O. performed as a quality cutting oil is expected to, and eliminated the need for two costly supplementary products: a special alkali cleaner and a rust preventive. Sprayed on the parts conveyed through the washers, S.E.C.O. left a film that gave complete protection against rusting. Oil costs were reduced to an amazing extent; floors were safe; complaints about skin irritations were minimized and shop morale improved. The pipe fittings, free of discoloration, commanded a better position saleswise. The company standardized on S.E.C.O. and has been using it ever since.

In all machine shop operations, on both ferrous and nonferrous metals, Sun Emulsifying Cutting Oil is definitely superior. That's why more S.E.C.O. is used than all other brands of emulsifying cutting oil combined. For more operational data on typical S.E.C.O. applications, write for a copy of the new "Cutting and Grinding Facts." Department **AM-11.**

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO

Transmission Roller Chain—IV

ice factors subsequently outlined must be adhered to in making selections from the rating tables. Failure to do so may result in unsatisfactory service from abnormal joint wear, accelerated chain elongation, and serious damage to sprockets.

A. *Service Factors* as given in accompanying Table 4 should be used in connection with the horsepower ratings, the load being multiplied by the factor to obtain the required chain capacity:

B. *Lubrication* of roller chains is essential for effectively minimizing metal to metal contact of pin-bushing joints of the chain. Oil should be applied to link plate edges as explained under Type I method of lubrication subsequently, since access to pin-bushing clearances is possible only through clearances between pin link plates and roller link plates of single chains, and in addition, between center link plates and roller link plates of multiple chains. Oil applied on center line of rollers can not reach pin-bushing joints and therefore can not retard chain wear elongation.

A good grade of mineral oil, without additives, of medium or light consistency, free flowing at the prevailing temperature, should be used.

Drives should be protected against dirt and moisture. The method of lubrication, which is influenced by the speed of the chain and the amount of power transmitted, should be in accordance with one of the following:

Type I: Drip (4 to 10 drops per min), shallow bath, or manual with oil applied frequently with a brush or spout can to upper edges of all link plates in the lower span of chain.*

Type II: Rapid drip (20 drops per min minimum) or continuous with shallow bath, disk or slinger.*

Type III: Continuous, with disk, slinger or circulating pump.

* A circulating pump may be required when transmitted horsepower is substantial and center distance is short.

The choice of method or type of lubrication should in general be guided by the following:

Chain Speed	*Method of Lubrication*
Up to 600 fpm	Type I
600 to 1500 fpm	Type II
above 1500 fpm	Type III

Heavy oils and greases are not recommended for lubrication of roller chains except under unusual conditions of service because they are generally too stiff to enter and fill the small clearances between the chain parts.

Table 4 — SERVICE FACTORS

Type of Load	*Conditions of Service* 10 Hr Day	24 Hr Day
Uniform Load — Average Conditions	1.0	1.2
Moderate Shock — Abnormal Conditions	1.2	1.4
Heavy Shock — Abnormal Conditions	1.4	1.7

Table 3 — HORSEPOWER RATINGS for SINGLE-STRAND CHAIN

1/4 in. Pitch – No. 25

Small Sprkt. Teeth	REVOLUTIONS PER MINUTE – SMALL SPROCKET 100	400	800	1200	1600	2000	2400	3000	5000	6000
11	0.051	0.16	0.29	0.40	0.47	0.53	0.57	0.61	....	....
13	0.61	0.20	0.37	0.50	0.61	0.70	0.76	0.84	0.90	....
16	0.076	0.26	0.48	0.65	0.80	0.92	1.02	1.13	1.33	1.29
20	0.095	0.33	0.60	0.82	1.02	1.18	1.31	1.49	1.76	1.78
25	0.118	0.41	0.75	1.03	1.27	1.46	1.63	1.84	2.20	2.22
40	0.187	0.63	1.13	1.55	1.89	2.15	2.36	2.63	2.84	2.65
60	0.274	0.92	1.60	2.10	2.48	2.80	3.04	3.16	....	....

3/8 in. Pitch – No. 35

	50	200	400	800	1200	1600	2000	2400	3200	4000
11	0.087	0.303	0.54	0.89	1.15	1.31	1.40	....	....	....
13	0.105	0.369	0.66	1.13	1.48	1.73	1.91	2.02	....	....
16	0.130	0.463	0.84	1.46	1.93	2.30	2.58	2.79	2.98	....
20	0.164	0.585	1.07	1.86	2.49	2.97	3.37	3.65	4.01	4.06
25	0.204	0.730	1.33	2.31	3.09	3.71	4.19	4.54	4.98	5.04
40	0.322	1.14	2.05	3.50	4.59	5.39	5.96	6.32	6.58	....
60	0.474	1.64	2.89	4.76	6.00	6.78	7.14	....	....	....

1/2 in. Pitch, Light-Weight Machinery Chain – No. 41

	50	200	400	600	800	1000	1200	1400	1600	1800
11	0.121	0.412	0.714	0.954	1.13	1.28	....	....	....	....
13	0.146	0.505	0.888	1.20	1.46	1.67	1.85	....	....	....
16	0.182	0.636	1.13	1.55	1.90	2.20	2.45	2.66	2.84	....
20	0.228	0.804	1.44	1.97	2.44	2.83	3.17	3.46	3.70	3.89
25	0.285	1.00	1.80	2.47	3.04	3.54	3.96	4.31	4.64	4.85
40	0.449	1.56	2.75	3.73	4.54	5.20	5.76	6.19	6.52	....
60	0.657	2.22	3.83	5.07	6.03	....	....	....	....	....

3/4 in. Pitch – No. 60

	50	150	300	500	700	900	1100	1300	1500	1700
11	0.66	1.70	2.93	4.12	4.93	5.41	....	....	....	....
13	0.79	2.09	3.65	5.27	6.46	7.32	7.88	....	....	....
16	0.99	2.64	4.66	6.82	8.52	9.80	10.77	11.46	....	....
20	1.25	3.34	5.93	8.74	10.97	12.74	14.08	15.10	15.78	16.14
25	1.56	4.17	7.41	10.89	13.67	15.86	17.53	18.79	19.62	20.06
40	2.45	6.46	11.31	16.33	20.08	22.84	24.64	25.33	26.10	....
60	3.58	9.21	15.66	21.80	25.81	....	....	....	....	....

1 1/4 in. Pitch – No. 100

	10	50	100	150	200	300	400	500	600	700
11	0.663	2.88	5.19	7.10	8.78	11.4	13.6	....	....	....
13	0.792	3.52	6.35	8.82	10.9	14.6	17.6	19.6	....	....
16	0.987	4.37	8.07	11.2	14.1	18.9	23.2	26.1	28.7	....
20	1.24	5.52	10.1	14.3	17.9	24.3	29.8	33.9	37.3	40.2
25	1.54	6.90	12.7	17.8	22.4	30.3	36.8	42.2	46.4	50.0
40	2.44	10.8	19.6	27.3	34.0	44.3	54.2	61.0	66.3	70.8
60	3.61	15.6	27.8	38.1	46.8	60.5	....	....	....	....

1 3/4 in. Pitch – No. 140

	10	50	100	150	200	250	300	350	400	450
11	1.79	7.55	13.3	17.8	21.5	....	....	....	....	....
13	2.13	9.19	16.3	22.3	27.3	31.6	35.2	....	....	....
16	2.66	11.6	20.8	28.6	35.4	41.3	46.4	50.7	....	....
20	3.34	14.6	26.4	36.4	45.3	53.0	59.8	65.6	70.7	....
25	4.17	18.2	32.9	45.5	56.5	66.1	74.5	81.7	88.0	93.4
40	6.58	28.3	50.6	69.1	84.9	98.2	109.1	118.2	126.7	....
60	9.67	40.7	70.9	94.8	113.9	....	....	....	....	....

Lubrication: Type I — Type II — Type III

Production News

ABOUT *Lusol*.. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

LUSOL—THE HOTTEST THING ON THE COOLANT MARKET

Today, right now, you can take the first step toward startling production gains in your own shop. The free book, offered below, gives you the facts about Lusol, the metal-working solution which is revolutionizing coolant practices and machining procedures. You'll learn how plant after plant, all over the country, has stepped up output from nearly every machine in its shop. Actual case histories of 50%, 200% and even 500% increases in machine speeds and production rates!

Lusol replaces soluble oils and emulsions, as well as regular cutting oils on many operations.

NEW TYPE COOLANT—The simple, factual evidence in this book shows *why* Lusol cools faster, increases tool life, reduces the number of grinding wheel dressings. You'll see how Lusol, an oil-free concentrate added to water, makes the best coolant you ever used. How it makes water wetter, so it removes heat faster. How it decreases the surface tension of water, so it penetrates to the very cutting edges of your tools and keeps grinding wheels from loading up.

You'll learn the extra advantages possible with oilless Lusol. Advantages like elimination of degreasing before painting or assembly. How floors and workers' clothes stay cleaner. No oil-soaked shoes. How Lusol licks machine odors and dermatitis. And how it protects machines and products from rust.

SAVINGS IMPRESSIVE—Truly, these are savings so important and far-reaching that no one who owns or operates a machine tool can afford to pass them up. So today take time to ask for your copy of the 20-page book, "Lusol, the all-chemical metal-working solution."

Over 40,000,000 Gallons of LUSOL SOLUTION USED TO DATE

In plants all over the nation, in almost every type of metal-working operation, over 40,000,000 gallons of Lusol solution have been used, boosting production rates, saving tools and lengthening grinding wheel life.

In each of these applications Lusol has replaced another coolant, showing substantial savings. Obviously, an enormous amount of technical know-how has been accumulated during these conversion periods. This data is constantly sent to Lusol sales engineers in the field. Your local Lusol sales engineer, listed in the classified phone book under "cutting oils," is well equipped to answer your questions.

users say*

case histories of Lusol at work

A BEARING MAKER—"Look at that fine finish! No smoke around the machine, and the bearing-half comes off the broach so cool it can be gauged for accuracy immediately."

•

A JOB SHOP—"41 drills and 25 taps were required for producing 1,984 pieces in 50 hours. Changed to Lusol and produced more pieces in same period with 12 drills and 8 taps."

•

A MOLDING MANUFACTURER—"Lusol keeps the machines clean; a distinct advantage over the lubricant we formerly used. The men like Lusol because they can see the work clearly, right up to the time the metal enters the rolls."

•

A MACHINE TOOL BUILDER—"We remove 245 cubic inches of cast iron per hour in that surface grinder. Instead of 17 wheel dressings per chuck load formerly required, only 7 are needed now with Lusol. We're going 100% to Lusol."

*User names furnished on request.

LUSOL proves mild and non-irritating to workers' hands

The cleansing action of Lusol, together with its super-wetting properties, sometimes prompts questions about dermatitis. "How does such an efficient metal-working solution affect workers' hands?" It doesn't!

The case of the man shown above is typical of Lusol's performance in actual shop conditions. Sulfurized cutting oil, formerly employed, so irritated this man's forearms that he had to wear the plastic sleeves you see in the photograph. With Lusol in his machine, he has discarded the sleeves; has no skin trouble at all.

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 215G, Portland, Conn.

TALKING SHOP

Old Oil, New Color

CLEAR or "white" oil is very difficult to see on metal parts, hence is often the cause of operators dropping parts because of unexpected slipperiness, or getting oil all over their clothing. Recognizing this problem, American Machine & Foundry Co. added red dye to all of these oils. When an operator on the automatics was asked whether the addition helped, he said, "Oh, it's much easier to see oily parts, but I've been wearing red underwear ever since you added the dye."

Philatelic Welding

NOT ANOTHER new welding process, but a note from Lincoln Electric that the Japanese have just issued a new postage stamp, honoring welding. The picture shows the welding of a locomotive, and the face value is 500 yen, about $1.35.

Big Rubber

A MAJOR AUTO PRODUCER has recently had an increasing number of complaints about shorting out of ignition. Checking showed the shorts occurred in a switch designed to cut out ignition momentarily while gears are shifted automatically. The switch is protected from oil by a rubber bellows and had been in use—with no trouble—for five years. But, recently, some switches have cut out ignition, then stayed out, an embarrassing thing in traffic.

Suppliers of the switches and the bellows were called in, to no avail. Rubber composition on the bellows was changed. More complaints came in. The engineers continued to suspect the rubber, so ordered six identified bellows from each cavity of the four-section die that turns out about 140 pieces at a crack. That took six weeks—and the complaints snowballed. When the set of bellows was checked, half were found to be oversize 0.003 in. That caused 'em to stick in the housing—and let the oil in to short the switch. Six years of use had worn half the cavities oversize. So new dies are in use now—and the old ones have joined the scrap drive.

Rigid Tool

TIME AND TIME AGAIN, short tool life can be traced to lack of rigidity, either in toolpost or shank. An engineer recently pointed out that, with shanks really heavy enough, heat is dissipated more rapidly from the carbide bit and there is far less tendency to flexing and vibration.

Tut, Tut, Tet

CARBON TETRACHLORIDE is again being employed as a coolant in machining some of the hard-to-cut alloys. Wm. Oldacre, president of D. A. Stuart Oil Co, Chicago, mentioned this at the recent Tool Engrg Conference at Urbana, Ill., then went on to point out its twin dangers. Most shop men are familiar with the immediate effects of carbon tet—similar to those of deadly carbon monoxide—so provide exhaust arrangements for fumes. But beyond that, the effect of the fumes is cumulative. On a long-term basis, they affect the liver like lead poisoning, causing permanent damage.

Blue Coat

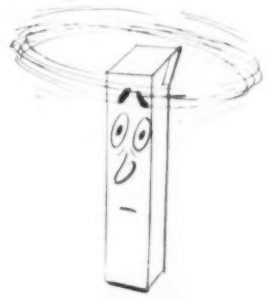
METALLIC OXIDES and phosphates are becoming known as coatings or lubricants for steel to be formed. They are also heard of occasionally as potential machining lubricants between chip and tool on the interface, where excessive pressures squeeze out anything but solids. Actually, one familiar process has anticipated this thinking. Some tap makers coat the blanks with layout bluing before climb-milling the flutes. Apparently some of the bluing is carried in on the rake face of the cutter teeth to provide a solid lubricant. With no other fluid, cutter-life expectancies are long.

Nipples & Needles

AT GLENN L. MARTIN, both baby nipples and hypodermic needles are in regular use. Nipples with the head cut off are fitted around the universal joints of swivel-type rivet peens to hold the ball-and-socket elements together. That prevents separation and damage to parts. The hypodermic needles are used, among other things, to inject fluid into minute air bubbles which sometimes appear in plastic-sheet pilot canopies and astrodomes.

Bearing Up

HIGHER SPINDLE SPEEDS needed for higher-speed machining are demanding basic changes in design. For example, one problem yet to be solved is spindle support. One answer may be sleeve bearings of hardened steel or carbide, another air bearings. In the first case, a basic problem is lubrication, which is really more nearly cooling—just as cutting fluids for high speeds must be more coolants than lubricants. Also, other machine tools elements must be designed to take the higher stresses and speeds.



Another problem is sufficiently long tool life. One objection to higher speeds on some jobs has been disproportionately short tool life between grinds, but the answers are now in the laboratory stage. Carbide makers have produced bits that are harder and tougher, have, for example, turned SAE 1045 at 1845 sfpm in the lab. But such super-carbides are not yet commercially available; they are not yet produceable in predictable quantities.

News of Metalworking

MAY GRAB USED CARS — Requisitioning of used cars was threatened by NPA if the auto wrecking business doesn't send a million tons of scrap to steel mills by December. As an alternative to requisitioning, NPA suggested an order limiting wreckers inventories to a 90-day supply.

AUSSIE CHRYSLERS IN '52 — Chrysler Corp. is speeding up plans to assemble cars and trucks at Mile End, South Australia, and is hopeful that first cars and trucks would roll early in 1952. Considerable quantities of equipment are to be brought from the United States.

NEW METAL TRADES HEAD — Charles S. Craigmile, president and director of Belden Mfg. Co., Chicago, was elected president of the National Metal Trades Association at the 52nd annual convention held in Chicago. Other officers: Earle S. Day, vice president and general manager, Collyer Insulated Wire Co., first vice president, and Norman L. Rowe, vice president of Ideal Roller & Mfg. Co., 2nd v.p and treas.

Demand for Rebuilt Machine Tools Steps Up,

BY LIONEL J. HOLMES
NEWS EDITOR

NEW YORK—The nation's machine-tool rebuilders have returned more than 5000 worn machines to new-tool accuracy since the Korean war started, an AMERICAN MACHINIST survey shows.

In turning out almost 300 machines monthly, rebuilders are taking a considerable load off manufacturers of new machine tools now pressed to deliver defense production equipment. Despite this output, the demand for rebuilt machinery is keeping pace, on a smaller scale, with demand for new tools, and major rebuilders in the Midwest and East report backlogs ranging from three to nine months.

Just how much rebuilders' backlogs can be whittled in the months ahead is important in light of the urgent need for machine tools, especially for the aircraft program. But capacity of the industry is tough to measure. Most of the larger firms rebuild all types of metalworking equipment. As one rebuilder put it, "it would be possible to rebuild six Hendey 14-in. lathes with the same facilities that you are rebuilding a large planer or slab miller." Other rebuilders, venturing rough estimates, came up with figures ranging from 30 machines a month to 125 a month.

• **Backlogs** in some instances are limited only by the amount of space available in plants. "Only the need of a telephone call and we could contract for the rebuilding of more than 1000 machines from one company alone," one rebuilder said.

Despite backlogs, most rebuilders are out looking for more business, in some cases only to maintain present backlogs. Two prominent rebuilders surveyed reported that they are not looking for new business. A New England executive declared that his firm is booked solid for one year.

Many Firms Won't Seek Price Increases Under New Capehart Order

WASHINGTON — The new Capehart-conforming orders put out by the Office of Price Stabilization may turn out to be something less than a bargain. Thousands of firms will find that the orders mean higher ceilings, of course. But for many businesses, the orders will cause more headaches than they will cure.

Result: OPS expects many of the 45,000 firms now pricing under the original versions of Ceiling Price Regulations 22 and 30 to elect to stay where they are—in other words to retain present ceilings.

• **The Capehart Amendment says** OPS must grant price increases "on a proper showing of costs." But few firms can allocate factory and general office overhead, item by item, or unit by unit, to show these costs. Any method of allocating overhead would involve mountains of work. With accounting staffs already working overtime on reports for NPA, many firms will decide that the increases due them just aren't worth the trouble.

Beyond this, there's also the possibility that including overhead costs may actually produce lower ceilings. Here's why:

In essence, CPR 22 and CPR 30 permit cost changes to be used as adjustments to pre-Korean base prices. Where costs have increased, a higher ceiling results; but where costs have declined, the reverse is true. Ceilings must be lowered and prices rolled back.

A decline in unit overhead costs would produce just such a roll-back. And the fact is that overhead costs per unit have declined for many firms whose volume has risen since Korea—heavy machinery makers, for instance. So careful computation may show that declining overhead more than offsets the higher ceilings that, say, wage increase might otherwise bring. In such cases, the manufacturer under CPR 22 or CPR 30 would do well to stay put.

Willys-Overland Reveals Specs on New Car

TOLEDO—The public hasn't yet seen Willys-Overland's new six-passenger car, but specifications just released by W-O indicate what's under the hood and hint at appearance.

Power plant is a 6-cyl F-head engine, developing 90 hp at 4400 rpm, with a compression ratio of 7.6:1. Top speed is 90 mph. Gasoline consumption is 35 miles per gallon at 30 mph in overdrive. Other specifications: 161-cu in. piston displacement; $3\frac{1}{8}$-in. bore; $3\frac{1}{2}$-in. stroke; inlet valve on the F-head measures $1\frac{3}{4}$ in.; exhaust valve in block, 1-9/32 in.

Wheelbase is 108 in.; Over-all length, $180\frac{7}{8}$ in. Outside width is 72 in. Seat width, 61 in.; height is 5 ft. Weight is 2560 lb.

Aviation influence is seen in the car's low silhouette and long, flowing lines. Hood and front fenders are shaped to conform with the general pattern of the entering edge of a plane's wing.

Except for the body (made by Murray) and the usual components, the new car is all Willys-Overland.

Industry Survey Shows

Field sales forces, in most cases, conduct this new-business quest. Salesmen are trained to buy used machinery, later to be rebuilt and sold, as well as to solicit contract business from manufacturers. In the latter case, procedure is for the manufacturer to ship his worn-out equipment to the rebuilder, who puts it in like-new condition and ships it back.

The *AM* survey revealed that rebuilding service is limited in most cases to standard machine tools. Occasionally a special machine is accepted, but not many.

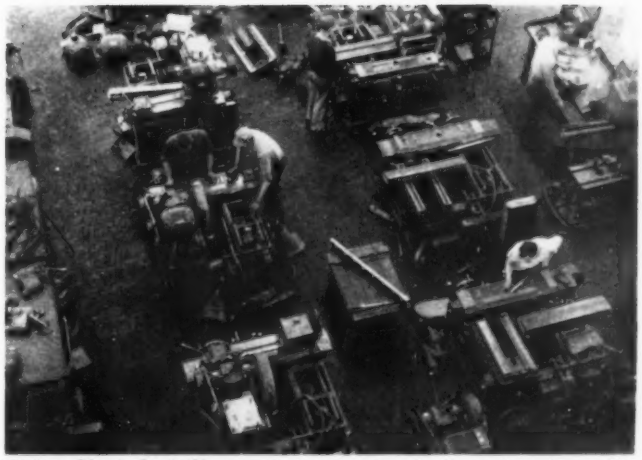
• **New tooling** is rarely involved, rebuilders reported. One of the larger firms stated that too much money is involved in many cases, and there is too great a time lag between completion of the job and when tooling is ready. This company makes every effort for the customer to order new tooling when needed, direct and not through the rebuilder.

Business is national in scope, the majority of rebuilders indicated. A few described their operations as "international." In some cases business is classified as sectional. One firm, for example, reports that about 75% of its business is confined to the eastern seaboard; another that work is done for companies in a 500-mile radius.

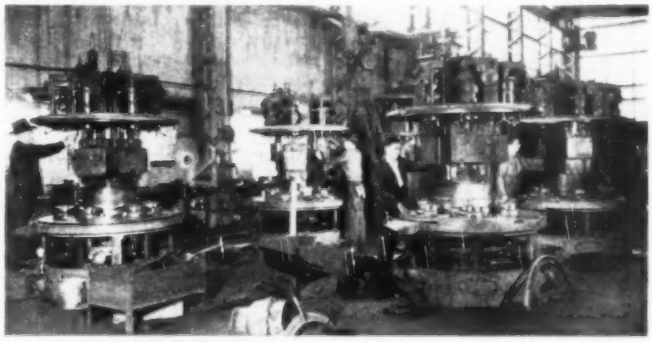
Labor isn't yet a critical factor in the rebuilding industry. None of the firms surveyed has been pushed into more than one shift yet, although almost all are working more than 40 hours. One Midwestern rebuilder has his 50 production workers putting in 60 hours each week; a smaller eastern company has its men on a 58-hour week. One New England firm is working 56 hours.

• **Materials and parts** pains are being felt by all rebuilders, but the situation isn't yet critical. If parts are tough to get, rebuilders make the parts needed. Some firms make almost all parts required. Practice in some instances is to order from the manufacturer, if the parts can be delivered on time to make the rebuilding schedule.

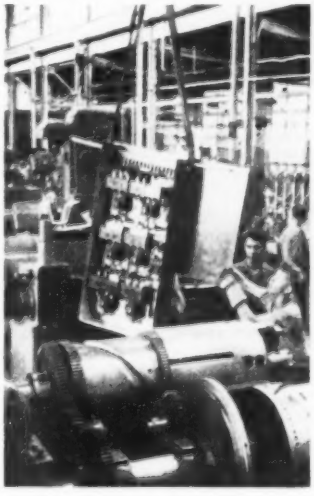
Deliveries, the survey showed, range all the way from two weeks to six months, depending on the nature of the job.

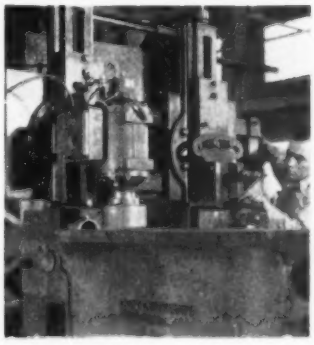


Most machine-tool rebuilders repair all types of production equipment . . . cylindrical grinding machines like these being realigned to proper center by Motch & Merryweather, Euclid, Ohio . . .



. . . **or a battery of Bullards,** like these being rebuilt by Morey Machinery Co., New York, one of the oldest firms in the business





A machine base (above) is being refinished on a planer to which Hill-Clarke Machinery Co., Chicago, has added a vertical grinding spindle.

Rebuilding work includes controls as well as machines. In photo at left a control panel swings into position at Simmons Machine Tool Co., Albany, N. Y.

Need to Double Machine Tool Output

Material to increase production will be made available, assures new head of NPA Metalworking Equipment Division

HOT SPRINGS, Va.—The machine-tool industry must double its production in the next nine months.

• It must subcontract just as much work as possible, raising its ratio of subcontracting from the current 15% to 30%.

• It must have further help from Washington, help which it is not getting, if it is to achieve these objectives.

• Government's policies should be shaped to leave the industry in a strong position in the post-defense era, because a nation's military potential can best be weighed in terms of its metal-cutting capacity.

These thoughts were brought home to the members of the National Machine Tool Builders' Association at its 50th annual meeting at The Homestead Nov. 7-9.

Add to today's backlog of $1.3 billion another $1.5 billion of tools to be ordered before next July 1 and you have some idea of the job facing the machine-tool industry, Swan E. Bergstrom, director, Metalworking Equipment Division of National Production Authority, said.

It is necessary, therefore, for the industry to produce at a rate of $1.5 billion-a-year by the middle of 1952, he concluded. That means doubling the current rate.

Mr. Bergstrom assured builders that "material will be made available to increase production to the desired level." First quarter of '52 will be tightest on materials, especially for plate, structural steel and aluminum.

• **Certificates of necessity** for machine-tool builders have No. 1 priority, he declared. In addition, NPA and General Services Administration are providing machinery on a rental basis to makers of critical machines and their subcontractors.

If wage increases are necessary to meet competition from defense plants, builders have assurance from Wage Stabilization Board that they will get special consideration, he said. The price people also will consider these increases as additional costs in pricing machine tools.

• **The machine-tool builder** actually has a third-rank priority today, so far as important components are concerned, M. A. Hollengreen, president, Landis Tool Co. and chairman of NMTBA's government relations committee, reported. In almost all plants, difficulty in getting materials on time is limiting production. One result is badly unbalanced inventories, which in turn absorb a large amount of the builder's cash resources.

Mr. Hollengreen said that the industry is still losing essential employees to the armed services. Local draft boards use their own judgment and are not influenced by Washington. About 12% of the men employed in machine-tool plants have been taken or are liable to be. The total number, some 9000 men, represents a serious loss.

A certificate of necessity simply authorizes a taxpayer to amortize the cost of new facilities over the next five years, he said. It does not excuse him from paying taxes; it merely defers a certain part of what he otherwise would pay in the form of taxes. But the value of such a certificate as an incentive to expand capacity by investing your own funds will be less if a policy of reducing the allowable ratio by 10% is adopted.

"Some parts of government policy are wise and helpful and other parts, while prompted by highest motives, are harmful and must be revised if machine-tool builders are to play their part in the defense program," Mr. Hollengreen emphasized. As broad policies filter down through successive ranks of the government hierarchy, the detailed regulations that finally issue leave much to be desired.

• **Every builder is free** to accept or refuse any contract terms as he pleases, despite the fact that buyers are increasingly inserting clauses placed in the prime contract by the government contracting officer, Tell Berna, NMTBA general manager, declared. He discussed a number of stipulations now being put into defense contracts.

Most objectionable clause of all is one that the contractor with a negotiated contract must make a report on his costs within 60 days

Subcontracting Urged for Quick Production Boost

• **Subcontracting** is the most practical way to increase machine-tool output in the shortest time, Richard E. LeBlond, president, R. K. LeBlond Machine Tool Co., asserted in his address as president of NMTBA. Subcontracting advantages cited are: (1) use of manpower where it now is; (2) use of management and engineering groups already in existence, keeping them intact for post-emergency production of their own products; (3) elimination of need for new plants; (4) allowance of subcontract costs in machine-tool price formula; (5) fastest method of expanding output.

Place to look first for subcontractors is among your own customers, "where you know the people and know what kind of equipment they have," Mr. LeBlond urged. If the industry does not line up subcontractors on its own, the government will decide arbitrarily that some industry, like the auto industry, is to build machine tools.

Mr. LeBlond scoffed at the idea that subcontractors may want to stay in the machine-tool business. He said that "giving a company a subcontract would be the surest way to persuade it that it could not compete with regular builders when the emergency is over."

In event of war, machine-tool plants in Europe might be knocked out overnight and the entire load of building machine tools for the democratic countries would fall on the United States, Mr. LeBlond pointed out. The faster we can build up our metal-cutting potential, the less the danger in case such a development should occur.

"It is up to our industry to maintain a continuous effort to educate more people as to what machine tools are and what they do," Mr. LeBlond declared. The more that can be done in that direction, the less will be the difficulties at the start of a defense program and the less the sales resistance when new models are introduced after the program is over.

for Defense

after completion of contract, Mr. Berna stated. Subcontractors to this prime contractor must keep their records for five years for government inspection. All necessary auditing will be done, however, in any one plant by one branch of the service. Such inspection does not warrant a readjustment of price unless elsewhere provided for in the contract.

Unless American machine tool builders can continue to sell machines in the world market, the size of the industry will dwindle, Mr. Berna charged. He read a letter from five French importers of U.S. machines to the effect that U.S. builders will lose the French market and their representatives in France, when the defense program is over, unless action is taken to supply U.S. machines in reasonable quantities to France for civilian requirements and unless ECA's drastic rules are amended. ECA has stipulated that Marshall Plan nations should buy U. S. machines only when European machines cannot be bought.

• **Almost 99% of ECA funds** for capital goods have been spent in this country by European nations, Charles J. Baker, director, Machinery Division, Mutual Security Administration, Washington, told members. Foreign governments, needing dollars, have screened out any commodities for purchase here if they could be procured from non-dollar sources. That is why so many ECA countries bought European tools.

Mr. Baker urged that machine tools be allotted on priority to South American countries possessing dollars with which to buy them. He said that his agency could not agree to the cutting off of all U.S. machine-tool orders basic to the economies of ECA nations, as originally planned in the amendment to NPA Order M-41.

The British have a defense plan which specifies exactly where every U.S. machine tool will go in plants making plane engines and land vehicles, James W. Buchanan, British Ministry of Supply, explained. Mr. Buchanan is on temporary leave from A. C. Wickman, Ltd., Coventry, England, machine tool builder. He pointed out that the British are trying to get their defense production going in phases. He said that defense manufacture is to be dispersed rather than under one roof because of Britain's vulnerability.

F. S. Blackall, Jr.

S. E. Bergstrom

H. L. Tigges

J. A. Raterman

R. S. Howe

W. A. Dermody

NEW OFFICERS AND DIRECTORS elected by NMTBA: Frederick S. Blackall, Jr., president of Taft-Peirce Mfg. Co., was elected president. Swan E. Bergstrom, vice president of Cincinnati Milling Machine Co., was elected first vice president, but given leave of absence to serve as director, Metalworking Equipment Div., NPA. Herbert L. Tigges, executive vice president of Baker Bros., Inc., was elected second vice president and director. Jerome A. Raterman, president of Monarch Tool Co., was re-elected treasurer. New directors elected, in addition to Mr. Tigges, were: Ralph S. Howe, executive vice president, New Britain Machine Co., and William A. Dermody, president and general manager, Carlton Machine Tool Co. Tell Berna was re-elected general manager, and Mrs. Frida F. Selbert was re-elected secretary.

• **The German machine-tool** industry's tremendous recovery was the outstanding feature of the Paris Show in September, Kermit T. Kuck, vice president of engineering, Monarch Machine Tool Co., declared. Designs of large machines are heavier, with sales emphasis on elimination of chatter. Hardened ways and greater use of way guards offset objections to inferior cast iron.

Germans have applied unit construction, using electrical synchronization for power transmission, Mr. Kuck stated. Variable speeds and feeds are obtained from electrical or hydraulic motors contained in independent units. Interlocking mechanisms are nicely worked out to eliminate trouble from simultaneous engagement of conflicting movements.

There are almost 450 builders in Germany's western zone, compared with 200 before the war, Mr. Kuck said. Many of them are new companies started by builders who brought over their designs from the eastern zone.

• **Tank, auto and farm**-implement makers are well on their way toward adopting boron steels, Alexander H. d'Arcambal, vice president, Pratt & Whitney, and chairman, NMTBA committee on metallurgical problems, reported. He discussed in detail alternate steels to conserve critical alloying elements. He said that some 400,000 tons of boron steels have been produced in the last 10 years and outlined the advantages and disadvantages of boron as an alloying element.

Mr. d'Arcambal's committee recommended using present steels as long as possible. If change is imperative, then machine-tool builders should switch to TS steels in the 8600 and 8700 series.

Col. Willard Chevalier, executive vice president, McGraw-Hill Publishing Co., Inc., was the speaker at the annual dinner, his topic being "Industry in an Arsenal Economy."

IT'S MOVING DAY . . .

• **Landis Tool Co.**, Waynesboro, Pa., has moved its Detroit branch office from 411 New Center Bldg. to 17151 Wyoming Ave., Detroit 21. The sales territory covers the state of Michigan.

• **Cincinnati Milling & Grinding Machines, Inc.**, and Cincinnati Milling Products Division have moved their Detroit territory direct office to 24100 North Woodward Ave., Pleasant Ridge, Mich. The new quarters occupy about twice the former space.

• **Precision Metalsmiths, Inc.**, Cleveland, has moved into its new office and plant at 1081 East 200th St., Cleveland 17.

• **H.E.B. Machine Tools, Inc.**, U.S. distributor of machine tools built by H. Ernault-Batignolles, of France, has opened new offices at 341 Madison Ave., New York 17.

• **Metal Parts & Equipment Co.** has opened new offices at 620 No. Michigan Ave., Chicago 11.

METALWORKING FIRMS BOUGHT

• **Automatic Steel Products, Inc.**, Canton, Ohio, has acquired Metroloy Corp. of New Rochelle, N. Y., producer of cold-formed steel articles.

• **New York Air Brake Co.** has purchased the stock of Hydraulic Equipment Co., Cleveland.

• **Spencer-Hughes Corp.** has purchased Cleveland City Forge Co. to supplement operations of Spencer Mfg. Co., a Spencer-Hughes division.

• **Norton Co.**, Worcester, Mass., has sold its labeling machine business to Standard-Knapp Div., Emhart Mfg. Co., Hartford, Conn. Norton's Grinding Machine Div. has been building Norton Oslund automatic labeling machines since Oct. 1946, when it purchased the Oslund Bros. Machine Co., Inc.

• **Topper Equipment Co.**, Matawan, N. J., manufacturer of metal cleaning equipment, has purchased Optimus Equipment Co., a subsidiary of Hanson-Van Winkle-Munning Co. Melville Morris, president of Topper, was president of Optimus.

Only Defense Projects May Obtain New Machine Tools

WASHINGTON—Output of machine tools will be reserved almost entirely for direct military and defense-supporting production under new and tighter regulations set down by the National Production Authority. To make certain that the full efforts of the machine-tool industry will be utilized in expediting the ouput of critically needed items, NPA ammended Order M-41, which controls scheduling of deliveries of metalworking equipment. The order now prohibits, with some exceptions, unrated shipments of specified metalworking equipment after Feb. 1, 1952.

• **The exceptions:** (1) A producer of one of the specified types of metalworking equipment may make deliveries of unrated orders after Feb. 1, if his total dollar amount in shipments scheduled for rated orders in a particular month is less than 70% of the dollar volume of average monthly shipments in first six months of 1950. Under these circumstances he may ship unrated orders in an amount to bring total shipments up to 70% of the dollar value of average monthly shipments in the first six months of 1950.

(2) A producer may accept and ship against GSA pool orders even though such shipments be unrated.

(3) If for other reasons a producer feels that it is necessary to ship unrated orders, he may appeal to NPA for exceptions under the terms of section 13 of the order.

The amended order continues the original requirement that producers of specified equipment must submit their delivery schedules to NPA and, in any one month, give first priority to rated orders from service purchasers up to 70% of the scheduled production for that month.

The revised M-41 also changes the list of metalworking machines to which the order is applicable, deleting welding machines and crankshaft regrinders (stationary). The list price which places the basic machine under coverage of M-41 has been lowered from $500 to $350.

• **NPA also issued a new order,** M-41A, which limits priority ratings to buy machine tools. Only companies operating at a government-authorized production rate higher than they were in the first quarter of 1951 are eligible to purchase machine tools. There are exceptions here, too, including one which permits applications to replace worn out machine tools.

Order M-40 was revoked by NPA. This order had provided priorities for machine tool builders having pool orders to enable them to get first call on raw materials. The order was made obsolete by CMP.

Surplus Tool Problem Vital

ROCKFORD, Ill.—Government must handle the machine tool surplus problem intelligently after the present defense program, if the machine-tool industry is to prosper, Burnham Finney, editor, AMERICAN MACHINIST, said at the dinner meeting on Nov. 14 of the fourth annual Special Conference on Machine Tools sponsored by the American Institute of Electrical Engineers.

Washington also must leave the industry with enough spendable money for research, development of new designs, and modernization of their own plants, he declared. Taxes and renegotiation should not be allowed to drain off all but a piddling percentage of builders' profits.

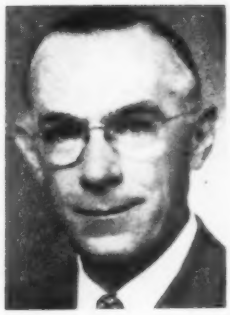
The U.S. Treasury should change its depreciation rates on new equipment to encourage replacement of old machines on a regular basis, Mr. Finney suggested. Quicker tax write-offs should be authorized.

The Machine Tool Conference's registrations were over 400, or more than double those of a year ago.

New NEMA Officers Elected

ATLANTIC CITY, N. J.—J. F. Lincoln, president, Lincoln Electric Co., Cleveland, was elected president of National Electrical Manufacturers Association. New vice presidents named: Arthur A. Berard, president, Ward Leonard Electric Co.; J. W. Corey, president, Reliance Electric & Engrg. Co.; J. H. Jewell, vice president, Westinghouse Electric Corp.; Alan F. Sheldon, president, Kennecott Wire & Cable Co., and Hoyt Post Steel, executive vice president, Benjamin Electric Mfg. Co. L. G. Hall, president of Stackpole Carbon Co., was elected treasurer.

L. E. Osborne



Tom Turner

John A. Matousek

Robert I. Hicks

Names in the News

L. E. Osborne, formerly vice president in charge of manufacturing, Westinghouse Electric Corp., Pittsburgh, has been named to the recently created post of executive vice —defense products. Mr. Osborne has been assigned responsibility and authority for all defense efforts of the company. **Tom Turner,** vice president in charge of labor relations, retains that post and also asumes the manufacturing responsibilities formerly assigned Mr. Osborne.

Harry H. Fair was elected chairman of the board of Caterpillar Tractor Co., Peoria, Ill., succeeding **C. L. Best** who died Sept. 2. Mr. Fair became a director of Best Tractor Co. in 1918, one of the constituents of Caterpillar Tractor Co. He was the prime mover in the formation of Caterpillar and has continuously been on its board and executive committee.

John P. Roche has been named executive vice president of Heppenstall Co., Pittsburgh. He has been vice president and general sales manager. **Harry O. Lang,** vice president of Heppenstall Co., Detroit, a subsidiary, succeeds Mr. Roche as vice president in charge of sales of the parent company. **Raymond T. Porter,** eastern sales manager, succeeds Mr. Lang in Detroit, while **George H. Wurster,** Boston-area sales representative, has been named eastern sales manager.

S. A. Oliver, chief tool designer for Standard Machine & Tool Co., Ltd., Windsor, Canada, has been named manager of engineering and sales. **R. J. Barrett** was named factory manager.

John A. Matousek has been elected vice president in charge of manufacturing, Baker-Raulang Co., Cleveland, and **Edwin W. Sankey** was elected vice president and assistant to the president. Mr. Matousek was named manager of manufacturing in 1949. Mr. Sankey will continue supervision of the Baker purchasing dept. and will coordinate engineering and manufacturing operations.

Louis Ruthenburg, chairman of Servel, Inc., was elected president of the Gas Appliance Manufacturers Assn., succeeding **Frederic O. Hess,** president of Selas Corp. of America. Other new officers: **A. B. Ritzenthaler,** first vice president; **J. F. Donnelly,** second vice president.

Robert S. Strawsburg has been appointed district manager of the Buffalo, N. Y. office of the Warner & Swasey Co., Cleveland. He was formerly resident engineer for the company in Europe.

A. L. Lentz has been appointed sales manager, Wm. S. Stamets Co., Pittsburgh. He was formerly associated with the Cincinnati Milling Machine Co.

F. I. Goodrich has been named general manager, Spring Div., Eaton Mfg. Co., Cleveland. He has been associated with Eaton since 1925 and has been factory manager of the Detroit plant since 1943. He succeeds **W. H. Wallace,** deceased.

Dr. Charles H. Moore has been appointed head of the Metal and Ceramic Div., P. R. Mallory & Co., Inc., Indianapolis. He was formerly technical director, National Lead Co.

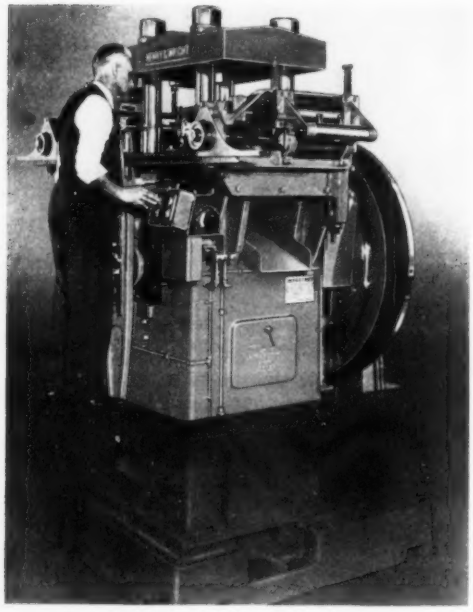
Robert I. Hicks, vice president and marketing manager, has been named president of Lamson Corp., Syracuse, N. Y., operating subsidiary of Lamson Corp. of Delaware, being relieved from direct administrative responsibility for Lamson Corp. Mr. Hicks will continue as vice president of the parent company. **Francis D. Weeks,** vice president and treasurer, was named to the newly-created post of chairman of the board of the operating and manufacturing corporation. **Carl F. Dietz** remains as president of the parent company, where he will maintain over-all policy responsibility, while the operating activities of Lamson Corp. will be the direct responsibility of Mr. Hicks, who will be general manager, and of Mr. Weeks.

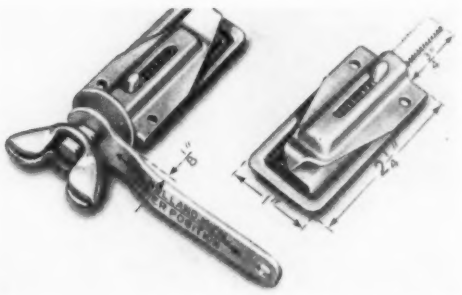
A. J. Wilhelm has been elected vice president in charge of manufacturing, Clearing Machine Corp., Chicago. He has been with Clearing since its founding. **Roy Prochnow** was named general superintendent of factory operations and **Fred Pottberg** was named master mechanic.

Leo J. Pantas, works manager of the Salem, Va., Division, Yale & Towne Mfg. Co., New York, has been named general manager of the Stamford Div., succeeding **Milo F. McCammon,** resigned. **Marvin C. Bonine,** who joined Yale & Towne as assistant to the works manager, Stamford Div., and has been director of its industrial relations dept., has been named to succeed Mr. Pantas at Salem.

G. Radcliffe Stevens, president, Elgin Mfg. Co., Elgin, Ill., has been elected president of Packaging Machinery Manufacturers Institute. Other officers: **Palmer J. Lathrop,** first vice president; **Edwin H. Schmitz,** second vice president.

New Shop Equipment





Washer, handle, and plates on damper regulator set made by Hart & Cooley, manufacturers of heating equipment, were produced on the 200-ton dieing machine. Their model has a special die bed opening to suit die within limits of bed. The roll feed is arranged to handle material up to 23-in. wide. Hart & Cooley are using 24 different dies on the machine—all arranged so that they can also be used in a 100-ton Henry & Wright which they have been using for a number of years

200-ton, Henry & Wright wide-bed dieing machine is equipped with automatic double roll feed and an automatic electric stop. Friction clutch is pneumatically actuated and pushbutton controlled

4500 Pieces per hr From Big Dieing Machine

Stroke	standard 3 in.
Upper Crosshead	52-in. long in direction of feed x 39-in. wide
Upper base	60-in. long in direction of feed x 45 in. wide
Roll feed	arranged to handle material up to 23-in. wide
Feed pitch	adjustable from 0 to 20 in.
Distance from die bed to metal line	7 in. min, 10 in. max
Steel bolster thickness	$4\frac{5}{8}$ in.

The Henry & Wright dieing machine is different from other presses in that the flywheel, crankshaft and connection are below the punch-holder instead of above. It has four other basic principles:

1. A low center of gravity, allowing high speed with minimum vibration.
2. A maximum guiding surface, including a four-post guide to punch-holder.
3. A pulling stroke of the die instead of pushing stroke.
4. Upper crosshead is required to take only the pressure necessary to perform the work in the die. In other presses the unit takes not only this pressure but also all crankshaft thrust.

The 200-ton wide-bed dieing machine is the largest ever made by Henry & Wright. Some of its features are: Water-cooled roll-feed brakes; automatic lubrication from a Madison-Kipp lubricator to principal bearings; and pneumatic counterbalance including two cylinders, surge tank, valves, gage, and piping on machine. It has an automatic electric stop exclusive of feed-detection means and an adjustable scrap cutter. The flywheel has a pneumatically actuated brake.

It is equipped with a variable-speed drive that provides a range of from 50 to 100 strokes per min. It includes a No. $6\frac{1}{2}$ G Reeves horizontal variable-speed transmission that is mounted on a separate foundation provided by the purchaser. V-belt drive and a motor-control and pushbutton station are other features.

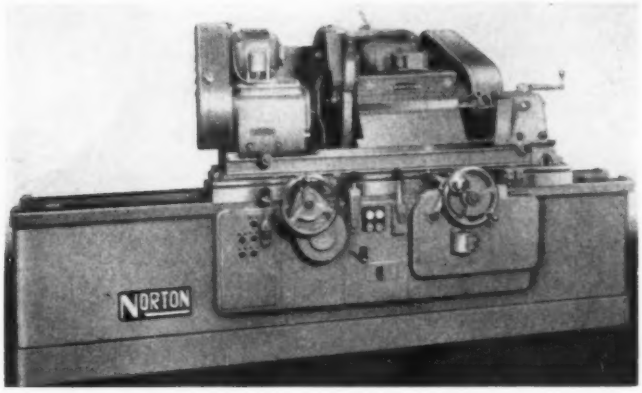
The double-roll feed is entirely automatic. It is claimed to provide extreme accuracy of feed at high speeds, continuous feeding of strips without stopping the machine, ease of operation by adjusting crank to or from center.

The dieing machine built for Hart & Cooley Mfg. Co., Holland, Mich., has a special die-bed opening to suit the die within limits of bed. Another change is in the roll feed, where they use a roller-clutch drive instead of standard ratchet-and-pawl drive. There is also a roll-lift mechanism.

Hart & Cooley are using the machine to make various parts for their standard registers, grilles, and furnace accessories. A typical part is a multi-shutter box end for a floor register. The material used was 0.032-in. cold-rolled steel 2-in. wide. Operations performed were form, reinforce, pierce, lance, and cut-off and the part is complete in the final operation. They are producing 4500 of these pieces per hr including time for coil change.

Henry & Wright, Div. of Emhart Mfg. Co., Hartford, Conn.

Materials and Parts



Norton Cylindrical Grinder Has Click-Count Wheel-Feed Indexing

Light work requiring up to 18-in. swing is rapidly ground in this machine. It is made in six work lengths, from 18 to 120 in., either plain or semiautomatic. Either rough or fine finishing jobs can be handled.

Work is produced with a minimum of effort. Features such as pre-set truing and grinding speed, click-count wheel-feed indexing, automatic work rotation, and coolant-flow control simplify operation.

Long, full bearings on the wheel spindle keep it on its fixed center line under any condition of load. Other features are: enclosed electrical controls mounted for stand-up servicing, pumps and motors outside the base, a coolant clean-out ramp, and ribbon steel base-way guards.

Norton Co., Worcester 6, Mass.

Group-Mounted Dressing Tools Have Diamonds in Powered Metal

Christensen group-mounted dressing tools are recommended for large OD, straight-face applications where high finish is required. Each tool contains five, six, or seven diamonds, so arranged that three to five are in contact with the work at all times. They are mounted in a powdered-metal matrix called C-metal. By rotating the tool in its holder at regular intervals wear is equally distributed among the various points.

Chisel-face tools are also supplied in this line; the diamonds are mounted in a straight line, and are primarily intended for large-diameter, wide-face dressing applications. As in group-mounted tools, the diamonds used are all whole, natural stones, with the hard outer skin still intact. This outer skin is said to be the toughest part of the diamond and constitutes one of the reasons for the greater efficiency of multiple diamond tools. The tools are guaranteed as to performance.

Christensen Diamond Tool Co., 9607 Traverse St., Detroit 13, Mich.

INCLUDING

Metal disintegrator rectifies ac without tubes and cuts at high speed. Maximum burning power is attained by a head which vibrates 60 times a sec page 176

36-in. dia chuck for right-angle lathes virtually eliminates jigs and fixtures for holding distorted pieces. Holding capacity is 12 to 36 in. page 177

Sheet-metal tester determines the actual workability of ferrous, non-ferrous, and fine-metal sheets and strips to the point of fracture page 186

Incompressible shock absorbers use minute layers of oil and air to neutralize the destructive forces of high-frequency vibration page 188

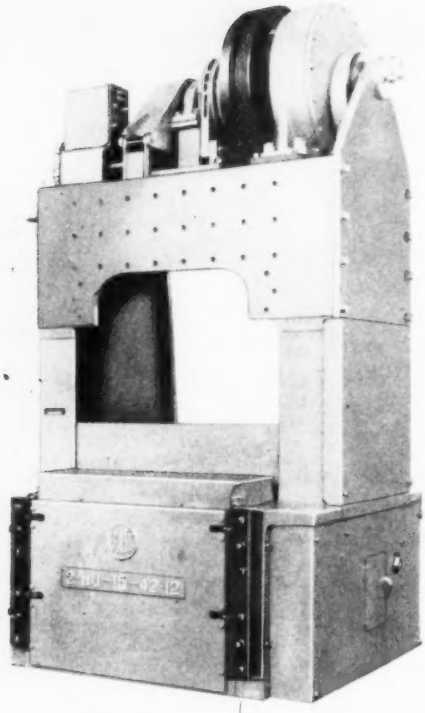
Shop phone system operates without batteries, derive their power directly from the voice itself. Safe for use in areas where inflammable materials are used or stored page 190

NEW BULLETINS for your shop library include: 70-page handbook of information on aircraft-steel specifications. It gives the equivalent stock for MIL, AN, and Fed. specs. pages 183 & 184

.... and in Dec. 10

Robot machinist uses electrical signals, converted from tape perforations, to actuate selsyn motors which tell the machine what to do. Remote control possibilities are practically unlimited.

Transfer-Matic processing machine for automotive crankcases produces 120 pieces per hr at 100% efficiency with 19 stations. Has an automatic chip conveyor and improved control of tools.



Bliss Gap-Frame Welding Press With Conveyorized Feeding

Gap-frame press is for use with welding fixtures in the mass production of spot-welded assemblies. It was developed in cooperation with a major automobile manufacturer. The gap frame permits conveyorized feeding from side to side, allowing easy access to the work from front or back.

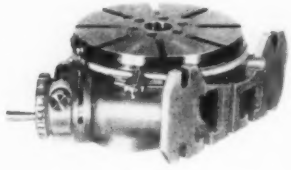
Stroke is upward with the slide located in the lower portion of the press. Work is placed on the lower "die", which contains welding tips, and moved up into contact with the fixed tips attached to the upper part of the press. The slide dwells in the upper position, holding the parts in contact with the electrode until welding is completed.

Pneumatic friction clutch, flywheel, and motor are located at the top of the press. The driveshaft is connected by a long eccentric rod to the slide-actuation mechanism which is enclosed against dirt.

Work stroke is adjustable with shut height the same for all adjustments. The operating cycle is divided into thirds—120° for upstroke, dwell, and downstroke. The machine can be started or stopped at any point in the cycle under load.

Slide widths range from 42 to 84 in. with 12 in. depth on all widths. Also, the presses can be built to order.

E. W. Bliss Co., Canton, Ohio.



Optical Indexing Table For Accuracy and Rapid Setting

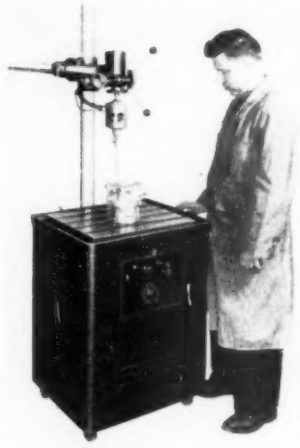
The Griswold Indexing Table is designed throughout to provide a high order of accuracy in use with milling machines, jig bores, die sinkers and similar machines for indexing and rotary milling. It may be used either in a vertical or horizontal position.

A high precision, engraved glass, degree scale is observed directly through a telescope which, in conjunction with circular dial, makes possible readings accurate to 0.0005 in. at the periphery of 12-in. circle. As the diameter of the circle decreases, accuracy increases. The reading is made at a normal viewing distance.

Effects of mechanical wear, backlash, and oil film thickness are eliminated. Reproducible results can be obtained in either direction.

The turn table is supported at its periphery about its entire circumference. The forged spindle is mounted on preloaded taper roller-bearings. Anti-friction bearings are used for all rotating shafts. A clutch permits hand rotation of turn table to facilitate positioning. Locking a spindle to prevent rotation does not disturb table setting.

F. T. Griswold Mfg. Co., Wayne, Pa.



Electro-Arc Metal Disintegrator Rectifies AC Without Tubes

AC power is rectified to dc on this disintegrator—causing the electrode to vibrate 60 times per sec. A downward-acting solenoid controls the head so that cutting only takes place during the positive peak of the sine wave, insuring maximum disintegrating power. Rectification is accomplished without tubes — thus there is no trouble with tubes burning out, etc.

The head may be chucked into any drillpress or other holding device and will operate at any predetermined compound angle or position. An auxiliary transformer, through the rectifier, gives 12v to the head.

Coolant pump—Direct-drive gear pump, $\frac{1}{4}$-hp motor producing 99 gph

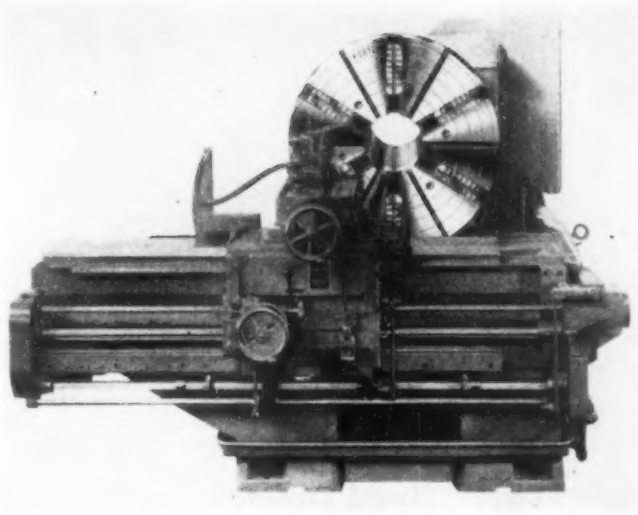
at 100 lb pressure. It is connected to a 5-gal. coolant tank built into the cabinet. The pump motor and disintegrating circuits are both controlled by a quick-lag circuit-breaker switch.

Power transformer—120-v ac with kva rating of 2½ on steady load and 10 kva on intermittent overload. Voltage is controlled by a Ohmite power-tap switch. Lead off from the secondary is carried to the work through a water-filled rubber-covered copper cable.

Two of the typical average cutting speeds cited by the company are: Disintegrate a ⅛-in. drill, 2 in. deep in 1½ min. Cut a 3/16-in. hole through 3/32-in. deep-hardened steel (62 Rc) in 10 sec.

All cable connections to the machine are individually different, making machine hookup errors impossible. Spare parts are available.

Electro Arc Mfg. Co., 5930 Commonwealth Ave., Detroit 8, Mich.



Horton Produces 36-in. Dia Chuck For Right-Angle Lathes

Developed to meet requirements of jet engine manufacturers, this chuck is made in a 36-in. dia size with a holding capacity of 12 to 36 in. It is of the Scroll combination type in which the jaws can be operated independentially, universally, or any combination thereof.

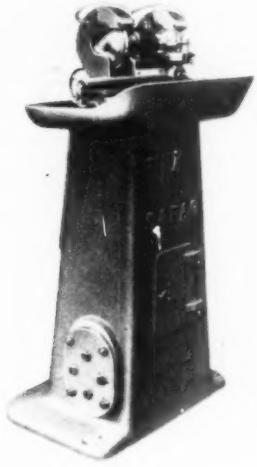
It is said to be especially adaptable for holding distorted pieces, which have been stress-relieved, in their "as is" position for machining. Costly single-purpose jigs and fixtures, etc. have been virtually eliminated.

The master jaws which are flush with the chuck face are T-slotted for attaching various clamping or holding devices. This feature makes it possible to use the chuck as a face plate, if desired.

Semi-steel construction is used on the body and is 5⅜ in. thick. Chucks are available for direct mounting on American Standard Spindle Noses. All chuck faces have reference lines to aid in setting up.

Hard reversible top jaws or soft blank top jaws are available if specified. The illustration above shows the chuck on an L&S T-Lathe.

The E. Horton & Son Co., Windsor Locks, Conn.

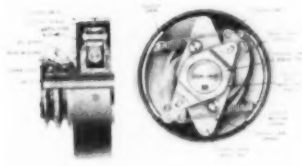


Swiss Machine Grinds And Laps Carbide Tools

Grinding-wheel dia	5.9 in.
Max. tool-shank size	.0.8x1 in.
Power required	0.7 hp
Gross weight with stand and motor	600 lb

The Safag machine can be used to grind and lap carbide tools used on Swiss or Swiss-type screw machines. Special equipment is used for: planing tools, drills, collet gripping, and for grinding the chip-breaker groove. The machine is priced at $1,155.00. Importer is:

Carl Hirschmann Co., 36 Park Ave., Manhasset, N. Y.



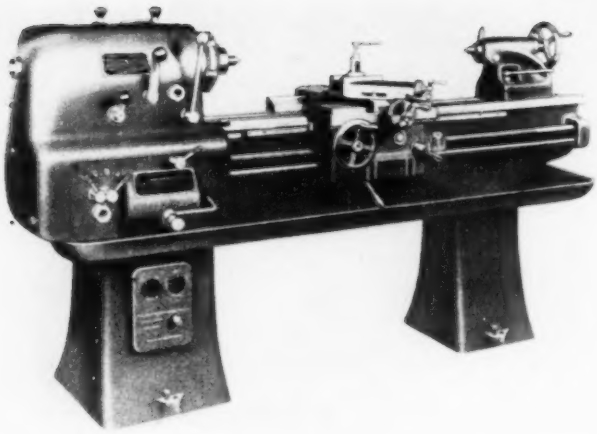
Salsbury's Automatic Clutch Has Wide Speed Differential

An automatic clutch featuring wide differential in engagement and disengagement speeds is the latest in Salsbury's Tog-o-log series. The clutches, designed for operation on any 7- to 15-hp engine with 1⅛-, 1 7/16-, or 1½-in. standard shaft, have a normal engagement speed—11 to 1200 rpm—but disengage at as low as 800 rpm. The wide differential is made possible by a linkage connecting heel and toe of the two opposing shoes.

This toggle lock is centrifugally actuated and equalized on both pickup and release of the load. Both clutch and pulley assembly ride free on dual ball bearings during idling periods. All models in the series have hub bores mating with standard engine shafts, without necessity for any extension, grinding, boring or slotting.

They are available in two models—with standard size pulleys with single and double grooves, or with plain hubs onto which special service pulleys may be mounted.

Salsbury Corp., 1161 E. Florence Ave., Los Angeles, Calif.



All-Geared Head Lathes From Colchester of England

These lathes, manufactured by Colchester Lathe Co., England, are made in three sizes with 13, 15, 17 in. headstocks. The front of the spindle is carried on SKF double-row cylindrical roller bearing with a combined thrust and radial bearing at the rear end forming a rigid spindle layout. Cutting thrust is taken by a precision ball-thrust race.

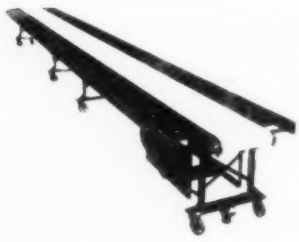
Feed and screw-cutting controls are interlocked to prevent simultaneous engagement. The apron is double wall, all shafts having two bearings. The bed is of the inverted V-type.

An American wing saddle is used, with long bearing surfaces carrying robust compound slides. All bearing surfaces are precision ground. The standard toolpost is of the American boat pattern. The tailstock uses a large-diameter spindle and screw.

All models have self-contained motor drive, controlled by a lever on the front of the headstock, operating through an air-break starter built into the machine. The headstock forms a totally enclosed oil bath which is self lubricating. Spindle nose is American long taper. The spindle is made from a high tensile steel.

Threads are all A.N.C. standard.

Dept M, International Machinery Div., British Industries Corp., 164 Duane St., New York 13, N. Y.



Horizontal Belt Conveyor Can be Varied to Suit Job

The Table-Veyor is adapted to a wide range of plant and job conditions. Here are some possible combinations:

LENGTH: May be varied from 10 up to 60 ft by adding or removing 5-ft sections.

WIDTH: Choice of 10, 12, 16, 18, or 20-in. belts. Side leaves are available that fit on either side of the belt to increase table-top working space.

HEIGHT: Adjustable from 21 to 40 in.

MOUNTING: May be lagged to the floor, or mounted on casters.

BELT: Four-ply, innerbound solid-woven cotton belt is standard. Others available.

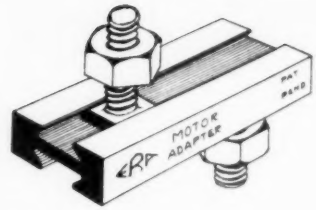
BELT SPEEDS: From 5 to 100 fpm—fixed or variable.

BELT DIRECTION: One-way or reversible.

MOTOR: 1/3 hp, 1 or 3-phase.

Any plant service department can install or make later changes in the unit due to its simple construction.

The Rapids-Standard Co., Inc., Dept TV, 342 Rapistan Bldg., Grand Rapids 2, Mich.



Adapter Plates Permit Motor Interchangeability

These motor base adapters will fit any motor up to and including 3 hp. They fit any base without drilling or filing. No holes can be out of line and no rotor shaft too long or too short.

The motor can be shifted forward or backward to obtain the proper belt adjustment and right or left for exact pulley alignment. The 3-in. tolerance permits use of longer or shorter rotor shafts and longer or shorter belts. The interchangeability of different size motors can be made at a moment's notice without serious loss of time and production.

An adapter set consists of four thin plates, eight bolts, washers, and hex nuts. The plates are so shallow that the motor is not raised enough to interfere with shrouds or other objects.

Engineering Research Association, 8475 East Nine Mile Rd., Hazel Park, Mich.

Gasoline fork trucks are designed for operation in and around highway motor trucks and freight cars. Called the Trucker series, they combine low weight, low over-all height, and good maneuverability. In capacities up to 2000 lb, it is only 68 in. high when the telescopic lift is collapsed. In duplex models, the truck can elevate its forks 54 in. before the secondary channels rise. All controls, including the hydraulic brakes, are automotive type.

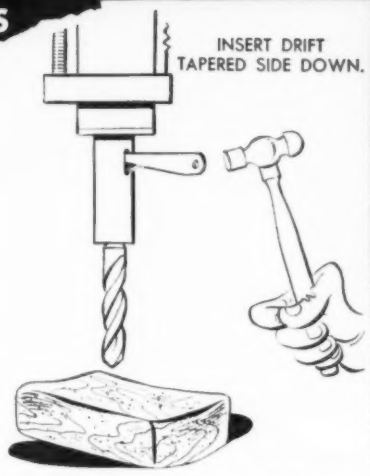
Philadelphia Div., Yale & Towne Mfg. Co., Philadelphia 15, Pa.

A self-locking anchor nut, made to Navy and Air Force specifications, of high-carbon annealed spring steel, crimped and then heat treated, grips the bolt within the span of the normally required number of threads. It does not need an auxiliary locking device and its hardness makes it practically impossible to cross-thread. Nut may be used at temperatures up to 700 F and is not adversely affected by solvents or lubricants.

Kaynar Mfg. Co., 820 E. 16th St., Los Angeles, Calif.

Get the most out of your

LELAND-GIFFORD DRILLING MACHINES



THERE'S ONLY ONE *RIGHT* WAY TO INSERT AND REMOVE DRILLS

TO INSERT...

Be sure the tapers of both drill and spindle are clean and dry. See that the tang is in the slot before driving the tool tight. Use a soft lead hammer or a block of wood to seat the drill — never a machinist's hammer which might damage the point.

TO REMOVE...

Always use a drift with the sloping side down and tap gently with a hammer. Never use a screw driver or file to remove a drill. A block of wood under the spindle will prevent damage to the point if the drill should drop while being drifted out.

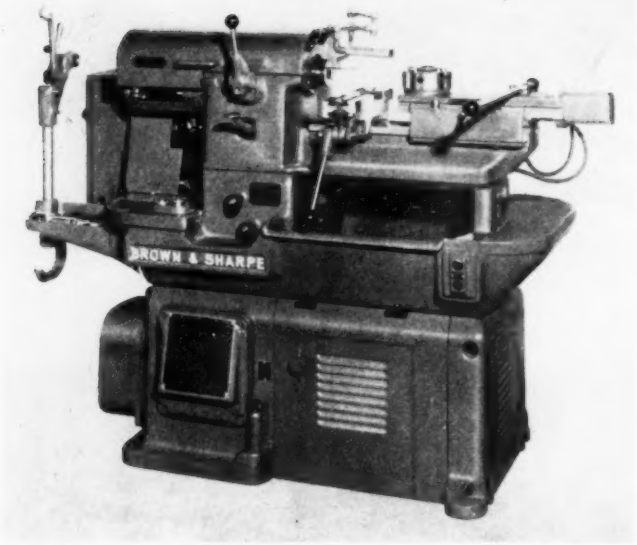
A small point? Yes... but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them ...with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

SAVE TIME **— CONTACT THE OFFICE NEAREST YOU**

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Redesigned B&S Hand Screw Machines Have Chain-Driven Spindle

MODEL	No. 00	No. 0	No. 2
Takes stock to, dia	$\frac{3}{8}$ in.	$\frac{5}{8}$ in.	1 in.
Where work permits to, dia.	$\frac{1}{2}$ in.	$\frac{3}{4}$ in.	$1\frac{1}{4}$ in.
Turns any length to	$2\frac{1}{4}$ in.	4 in.	6 in.
Spindle speed range (rpm)	6050 to 50	4230 to 35	3025 to 25
Horsepower	3	3	5

Redesigned to cover the field of former wire-feed screw machines, the B&S hand screw machines, Models 00, 0, and 2, have many new features — particularly the spindle with its wide range of speeds and ratios.

The full antifriction-bearing spindle has positive chain drive at all speeds and a completely enclosed drive similar to B&S automatics. It provides 196 two-speed combinations with ratios of high to low speeds from 1.6:1 to 13:1. Speed changes are made by simple pick-off gears.

The quick-operating one-lever spindle control and mushroom-top trip lever for automatic chuck and bar feed are of similar design to those on the corresponding wire-feed machines and the cross slide and turret have the same features.

Automatic oiling is provided for all major mechanisms and bearing surfaces throughout the machine.

Feed tubes, feeding fingers, collets, and other tools from the automatics are used in these machines to reduce toolroom inventories.

Standard equipment includes adapters to take Nos. 10 and 10A feeding fingers; 3 toolposts; 3 raising blocks; speed change gears; wrenches; and front and rear stock supports. A silent stock support is furnished at extra cost.

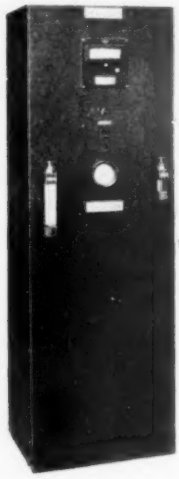
Brown & Sharpe Mfg. Co., Providence R. I.

Porter Electrode-Tip Dresser Has Floating-Cutter Blade

The Flushtype Electrode tip dresser permits dressing of straight or tapered electrodes in seconds, without removing them from the welder. It fits flush with the dressing tool or can be used with most power tools such as lathes, right-angle drills and drillpresses with a $\frac{3}{8}$-24 threaded extension. Special sizes are available.

Compact in design, the dresser comes in two parts, the chuck and high speed steel blade. The overall height is $\frac{3}{4}$ in. The floating-cutter blade floats in the chuck body providing uniform cutting action on both edges and correct centering of the electrode as the tip is reshaped.

C. O. Porter Machinery Co., 666 Front Ave., N. W., Grand Rapids, Mich.



Atmosphere Generators From Hevi Duty

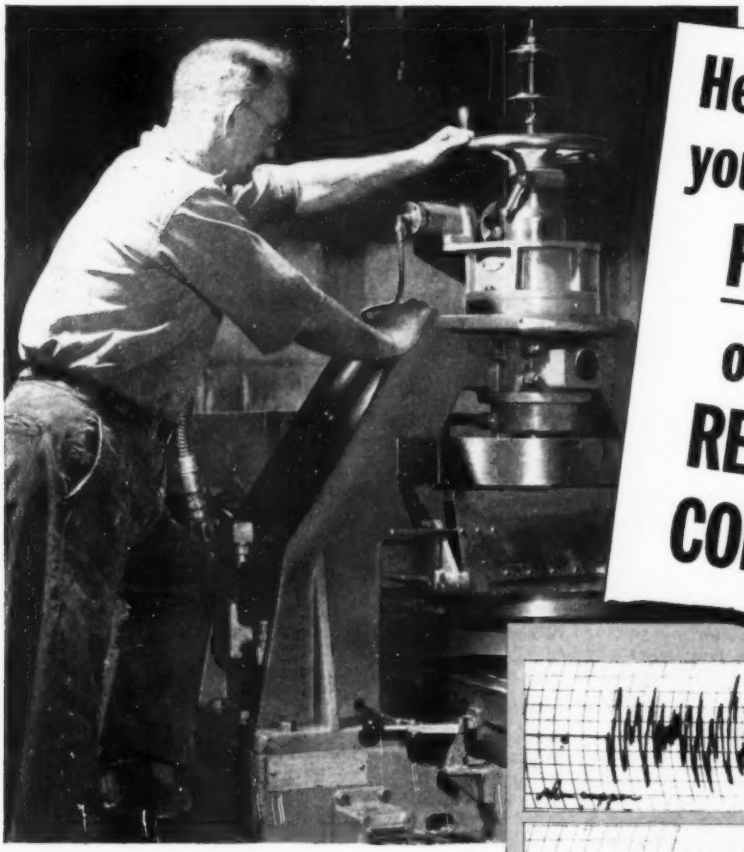
The Atmo-Gen line of atmosphere generators are used to provide atmospheres for the following heat treating operations: clean non-decarburized hardening, dry cyaniding or carbonitriding, carburizing (carrier gas), copper and silver brazing, nitriding, sintering, and bright annealing. The unit delivers 150 cu ft of atmosphere per hr.

It consists of an ammonia cracker which is housed in a fabricated steel cabinet. Standard equipment includes an electric tube furnace with automatic temperature control, a catalyst-filled alloy retort, necessary piping, and flow regulation accessories.

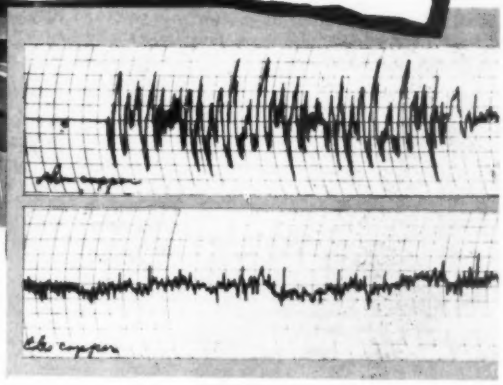
Hevi Duty Electric Co., Milwaukee 1, Wis.

Known as Permo Potting and Sealing Compounds, these products have been designed for use where high electrical insulation and low moisture transmission is required as in the electronic field. The compounds are said to be ideal for the casting and sealing of electrical parts.

H. V. Hardman Co., 571 Cortlandt St., Belleville, N. J.



Here before your eyes is PROOF of fine REVERE COPPER



Diamond surfacing machine in the Edes plant, producing a perfect surface on a Revere Copper Sheet.

Charts showing typical surfaces. Top, ordinary copper plate. Bottom, a diamond-finished Edes plate. It takes fine copper to produce this result.

• One of the country's best-known suppliers of copper plates for photoengraving is The Edes Manufacturing Company, Plymouth, Mass. Edes has developed a patented process that is unique for giving plates the final polish. They are surfaced with diamond cutters, specially cut and ground. The plates thus produced and shipped to photo-engravers have an accuracy of plus or minus .00025 inch, practically dead flat and true to gauge at any point within these limits. Obviously, only exceptional copper will do.

Making copper sheets for this service is an exacting process. The metal as supplied by Revere must be specially handled in the mill to make sure there are neither surface nor imbedded imperfections, since a pin-point defect in the finished plate will show in printing.

Revere has always taken a deep interest in the graphic arts, not only because the industry is a good market for copper, but also because Paul Revere himself was a skilled engraver on copper. Thus it is likely that the original plates for this advertisement were of Revere Copper, and also many of the plates used by the magazines you read. In addition, Revere supplies copper rolls for rotogravure, the comics, and for textile printing. For fine copper for graphic processes, consult Revere.

REVERE 150th YEAR OF SERVICE TO AMERICA

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Densified-Wood Forming Dies

The material for these dies to form aircraft-wing ribs (top photo) and control-surface details (bottom) is densified wood, impregnated with Bakelite phenolic resins.

The wood, compressed to approximately ½ the original veneer thickness, is claimed to have toughness, impact strength and good dimensional stability. Because of the impregnation, the wood also has a low coefficient of friction.

Built up of thin veneers that are dried to 5% moisture content, the resin impregnate replaces the air in the wood cells and soaks into the cell walls. The wood panel is then dried under heat and cured under heat and pressure.

Variations in resin-content curing time, temperature, and pressure produce differences of water resistance, impact and flexural strength to fit the application.

Parkwood Corp., Wakefield, Mass.

Clark 15,000-lb Fork Truck

The Yardlift-150 is for outdoor handling of extra-heavy loads. In spite of its size, it is said to be easy to steer and maneuver. This is achieved by use of a 22-in.-dia handwheel which operates a hydraulic steering control. In case of engine stoppage, the steering linkage can be operated mechanically. The truck is compactly designed for a minimum turning radius, and comfortable riding.

Among structural features is an extra-wide axle to provide max. stability under load. The frame is of heavy construction, the truck pneumatic tired.

Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.

Portable Electronic Indicator For Chucking Setups and Runouts

The Indi-Ac electronic indicator is a portable, high-precision instrument for checking setups and runout on the machine and for surface-plate work in shops, toolrooms, and gage rooms.

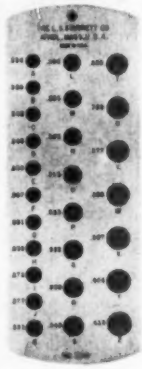
It consists of (1) an induction-type gage head adjustably mounted on a stand, and (2) a high-stability 4-tube amplifier with a 2-scale meter. The gage head has a frictionless movement, with no mechanical amplication; the amplifier is free of drift; and readings are not affected by any ordinary changes in temperature of gage head or fluctuations in line voltage. Consistent repeat readings are obtained at all times.

Two continuous linear scales on the meter read 0.0005 in. and 0.00005 in. or 0.0001 in. and 0.00001 in. per division, on either side of zero. The two scales can be used interchangeably at will; and both scales always give the same reading for any measurement within their range. Response is instantaneous, without overshoot, permitting fast readings and dependable runout measurements.

The instrument is light in weight, sturdily built, and can be used wherever a. c. power is available for the amplifier. The gage head permits access to ID's, thin shoulders and remote surfaces, with the amplifier located for convenient reading. The gage head can be used with the contact tip at any height from 0 to 24 in. above the surface on which the stand is placed, and (with support bar horizontal) at any distance between 4 and 10 in. from front of base.

To facilitate setup, the saddle on the column is adjusted vertically by a rack and pinion, and the gage head has a fine-adjustment screw (92 threads per in.) without backlash. Other features include 50-second warmup; 1-oz. contact pressure; and replaceable contact finger with overtravel protection.

Graham-Mintel Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio



Letter-Size Drill Gage

Letter-size drills can be quickly and conveniently checked by this gage. 26 gaging holes are provided giving corresponding drill sizes from A through Z with decimal equivalents from 0.234 through 0.413 in. dia.

The gage is 5 64 in. thick, 2 5 16 in. wide, and $6^1/_4$ long. It is hardened and ground with a bright finish and tested after hardening.

The L. S. Starrett Co., Athol, Mass.

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 BELT GRINDERS—*Hammond Machinery Builders, Kalamazoo, Mich.* 20-page catalog describes belt backstands, polishing lathes, belt grinders, grinder-polisher combinations, no-dust grinders, and dust collectors.

2 PRESS UNLOADERS—*Sahlin Engineering Co., Birmingham, Mich.* 8-page catalog describes three sizes of the Iron Hand and shows how it can be adjusted to different heights, widths, etc.

3 PRESS MAINTENANCE — *E. W. Bliss Co., Canton, Ohio.* 28-page manual gives complete operating and maintenance instruction for the co's straight-side, double-crank presses.

4 GEAR HOBBER—*Michigan Tool Co., Detroit 12, Mich.* Bulletin illustrates and describes a single-spindle, high-speed hobber. Gear layout shows how unusual smoothness has been obtained.

5 FACE GRINDERS — *Mattison Machine Works, Rockford, Ill.* 8-page bulletin gives details and specifications on traveling-table face grinders for face, knife, and shear-blade grinding.

6 PUNCH PRESSES—*Waterbury-Farrel Corp., N. Tonawanda, N. Y.* 8-page catalog TC illustrates and describes a new twin-column presses for blanking, forming, drawing, and bending.

7 DRILL UNIT—*Rockwell Mfg. Co., Milwaukee 1, Wis.* 12-page catalog illustrates and describes a Delta drill unit for drilling, reaming, centering, spot-facing, etc. It features hydraulic feed.

8 LATHES—*South Bend Lathe Works, South Bend 22, Ind.* 28-page foldout, miniature catalog describes toolroom, turret, and bench lathes; drillpresses; shapers; and lists accessories.

9 FLUID TRACERS—*Sidney Machine Tool Co., Sidney, Ohio* 8-page bulletin illustrates and describes a fluid-tracer attachment for Sidney lathes.

TOOLS AND ACCESSORIES

10 CHUCKS—*Union Mfg. Co., New Britain, Conn.* 96-page catalog No. 63 covers independent, self-centering, combination, air-powered, planer, and boring-mill chucks. Other subjects covered include method of manufacture, care and maintenance of chucks, how to mount chucks and air cylinders, and special chucks.

11 STELLITE TOOLS—*Haynes Stellite Co., Div. Union Carbide and Carbon Corp., Kokomo, Ind.* 44-page booklet includes: Properties of Stellite alloys; physics of metal cutting; advantages and description of the alloys; cutting angles, speeds, and feeds; machinability ratings; milling feeds and speeds; how to grind and braze the tools; and various tools forms.

12 GRINDING OF TOOLS—*The Carborundum Co., Niagara Falls, N. Y.* 70-page booklet No. 10 tells how to grind: reamers, chasers, drills, taps, broaches. It also explains how to do surface, cylindrical, and internal grinding, how to lap, and abrasive grading recommendations.

13 CHUCKS—*The Skinner Chuck Co., New Britain, Conn.*, 68-page booklet shows all types of standard and special chucks. Also covered is the care of chucks, lubrication and cleaning, and safety measures.

14 SPADE & CORE DRILLS—*Conner Tool & Cutter Co., Detroit 3, Mich.* 52-page catalog and price list shows these drills in sizes between 11/64 to 5 in. dia. in steps of 1/64 in. They are interchangeable in 8 sizes of holders.

15 FLEXIBLE-SHAFT MACHINES — *Stow Mfg. Co., Binghamton, N. Y.* 8-page folder describes and illustrates flexible shafts for grinding, sanding, wire brushing, drilling, etc.

16 OPTICAL COMPARATORS—*Jones & Lamson Machine Co., Springfield, Vt.* 33-page catalog covers a complete line of optical comparators and attachments. Also includes lens data, glass scales, and blank-drawing charts.

17 TOOL BITS—*The Duall Co., Des Plaines, Ill.* 4-page catalog shows the three grades: molybdenum, tungsten, and cobalt and recommendations on their proper use.

18 SOCKETS — *The Apex Machine & Tool Co., Dayton 2, Ohio* 122-page

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FYI — For Your Information

catalog lists a complete line of sockets, extensions, adapters, and universal wrenches.

19 SINGLE-POINT TOOLS—*The Doall Co., Des Plaines, Ill.* 8-page catalog covers carbide straight-turning, lead-angle turning, pointed-nose, threading, square-nosed, and other tools.

20 AIR SCREW DRIVERS—*Ingersoll-Rand Co., New York 4, N. Y.* 8-page bulletin describes a line of cushion-clutch air screw drivers in three basic sizes.

HEAT-TREATING AND WELDING

21 WELDING-ALLOYS CHART — *Eutectic Welding Alloys Corp., Flushing, N. Y.* Wall chart contains specifications on close to 200 alloys including bonding temperatures, tensile strengths, recommended uses, etc.

22 WELDING RODS — *The American Brass Co., Waterbury 20, Conn.* 24-page illustrated booklet on Anaconda Welding Rods and procedures. Includes tabular data, Navy and Fed. spec., and applications for production and repair welding.

23 MIXING GASES—*National Welding Equipment Co., San Francisco 6, Calif.* 16-page illustrated brochure on oxy-acetylene flame adjustment with the National needle valve. Includes applications and tables.

24 ARC WELDING—*Hobart Bros. Co., Troy, Ohio.* 40-page illustrated pocket-size guide of arc-welding information. Gives information on metals and electrodes, procedures, reference data, etc.

25 WELDING ACCESSORIES—*Tweco Products Co., Wichita 1, Kan.* 12-page illustrated catalog describing line of electrode holders, cable connectors, etc. Contains information on care and maintenance of welding equipment.

26 AIRCRAFT STEEL—*E. F. Houghton & Co., Philadelphia 33, Pa.* 4-page technical bulletin on heat-treating aircraft steel to meet U. S. spec. MIL-H-6875. Includes charts and tables.

PLANT-SERVICE EQUIPMENT

27 MATERIALS HANDLING — *Phila. Div., Yale & Towne Mfg. Co., Phila. 15, Pa.* 24-page illustrated booklet of evaluations and analyses or cost cutting through proper materials handling.

28 WIRE SLINGS — *The Cambridge Wire Cloth Co., Cambridge, Md.* Illustrated folder explaining applications of woven-wire slings in handling tubing, bars, or shapes.

29 CLARK PRODUCTS—*Clark Equipment Co., Buchanan, Mich.* 32-illustrated booklet describing the company's products, including axles, transmissions, drive units, etc., and materials-handling equipment.

30 SPRAY PAINTING—*DeVilbiss Co., Toledo, Ohio.* 16-page rotogravure brochure on industrial applications of diversified spray-painting equipment. Uses nearly 100 photographs.

31 VACUUM IMPREGNATION—*F. J. Stokes Machine Co., Phila. 20, Pa.* 22-page illustrated catalog explaining the process, vacuum impregnation. Includes applications, specifications, and descriptions of equipment.

32 ELECTRIC HEATERS — *Edwin L. Wiegand Co., Pittsburgh 8, Pa.* 4-page illustrated folder on a complete line of packaged electric heaters. Gives applications, construction data, and specifications.

33 CRATING SERVICE—*Sterling Lumber & Supply Co., Chicago 28, Ill.* 4-page illustrated folder on uses and construction of boxes and crates for all shipping purposes.

PARTS AND MATERIALS

34 MOTOR CONTROLS — *The Clark Controller Co., Cleveland 10, Ohio.* 88-page illustrated book on motor starters, controls, and other accessories. Includes descriptions, applications, engineering data, and price lists. Use company letterhead.

35 NICKEL CAST IRON—*International Nickel Co. Inc., New York 5, N. Y.* 36-page illustrated technical bulletin describing 8 types of austenitic nickel-alloy cast iron. Includes applications, service data, and reference charts.

36 PRESSURE SWITCHES—*Barksdale Valves, Los Angeles 11, Calif.* 32-page illustrated manual on a line of pressure switches. Includes reference data, operating characteristics, tables, and circuit detailing.

37 SOLENOIDS — *The National Acme Co., Cleveland 8, Ohio.* 20-page illustrated brochure on a line of Stellite-welded solenoids. Describes construction, functions, and design characteristics.

38 AIRCRAFT STEELS — *Joseph T. Ryerson & Son, Inc., Chicago 80, Ill.* 70-page handbook of information on aircraft-steel specifications. It gives the chemistry, condition, form, and equivalent stock for MIL, AN, and Fed. specs.

39 SPEED CONTROL — *Gerbing Mfg. Co., Northbrook, Ill.* 30-page illustrated catalog describing Roto-Cone variable-speed pulleys, companion sheaves, motor bases, and V-belts.

40 STEEL BARS — *LaSalle Steel Co., Chicago, Ill.* A reference-guide wall chart on standard and alloy-steel bars, showing chemical analyses and other data on over 275 different grades.

41 PRESS MOTORS — *Howell Electric Motors Co., Howell, Mich.* Technical bulletin on punch-press motors. Contains application information and data on high-slip, high-torque motors for punching, forming, and shearing machines.

42 PLASTICS — *The Richardson Co., Melrose Park, Ill.* 24-page illustrated booklet of facts about plastics. Includes advantages and limitations, materials and processes.

43 TUBE FITTINGS—*Crawford Fitting Co., Cleveland 10, Ohio.* 12-page illustrated catalog on the line of Swagelok tube fittings. Includes dimensions, drawings, and engineering data.

44 FLEXIBLE COILS—*Prym Engineering Co., Dayville, Conn.* 6-page folder on the use of Spirol machine pins, a fastening device for varied requirments. Includes dimensions, applications, and prices.

MISCELLANEOUS

45 DESIGN OF UPSETTING DIES—*The Ajax Mfg. Co., Cleveland, Ohio.* 32-page brochure covers in detail the design of dies for upsetting forging machines. Four pages show typical work.

46 TOOLING UP FOR PLASTICS — *The Carpenter Steel Co., Reading, Pa.* 40-page booklet covers such questions as: What steel should be used for large molds? What is the best hobbing procedure?

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American Machinist
330 W. 42nd St.
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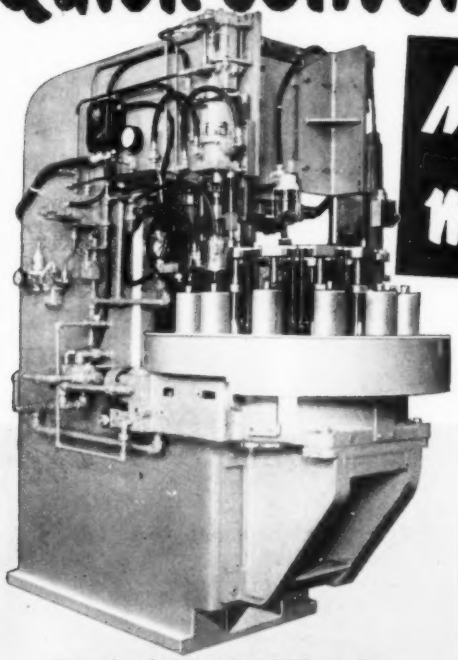
Quick conversion cuts costs

MULTIPRESS® makes it easy!



Standard MULTIPRESS makes quick, automatic work of hydrostatic testing operation

The ingeniously tooled unit above is a striking example of the ease with which any standard Multipress can be adapted to changing needs. The press is equipped with a 12-station HydrOILic Index Table. At each station an oil-filled steel housing surrounds a spindle over which finished rocket bodies are inserted. At the index station just ahead of the press ram position, the rocket bodies are automatically screwed down and sealed shut by a hydraulic device attached to the press frame. Now ready for testing, the assemblies index under the press ram, where compression builds up terrific oil pressure within the rocket body. Units that hold up under these pressures are automatically die stamped and loosened from the fixtures by auxiliary hydraulic units interlocked with the press circuit. If failure occurs, the press stops instantly, a red warning light goes on, the marking device fails to operate, and the press is locked out of operation until authorized government personnel can inspect and record the failure, and reset the electrical system with a special key.

Multipress has operating advantages and automatic control features that pay extra dividends *two ways!*

1. They meet armament production needs with higher speeds, quality control, and fewer rejects.
2. They make it easy to convert quickly to a wide range of civilian production needs, at any time.

Some of these Multipress features, *proved in more than 6000 applications*, include:

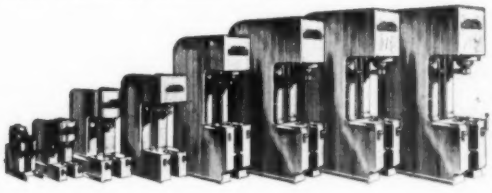
1. Automatic time delay, for ram dwell or similar needs.
2. Automatic inspection devices easily interlocked with the press hydraulic circuit.
3. Automatic Index-Table Feeds permit one, two or several operators to load fixtures at up to twelve stations while parts are being processed under the press ram. Other automatic feeds also available.
4. One or more auxiliary operations (as in the job described at left) can be handled by devices attached to the press frame and interlocked with the hydraulic circuit of the Multipress itself.
5. Safety is provided by several Multipress features. The ram is under complete, split-second control throughout its entire sequence. With Multipress Index-Table Feed, operator's work is removed from the ram area.
6. Low initial cost plus relatively low cost of adding interlocked auxiliary units and accessories cut costs of "tooling up" for specific operations.
7. Full, stepless adjustability and accurate control of the ram's speed, pressure, and stroke length assure easy adjustment to changing production needs.

These are only a few of the Multipress features that cut production costs *and save time and money* whenever you convert from one type of production to another. Deliveries too, are better when standard presses can be utilized.

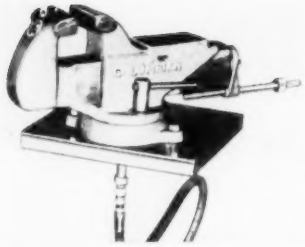
Multipress is available in eight frame sizes, with capacities of 1, 2, 3, 4, 6, 8, 10, 15, 25, 35, and 50 tons. Standard accessories for numerous special needs. Write today.

The DENISON Engineering Co.

1164 Dublin Rd., Columbus 16, Ohio



DENISON HydrOILics

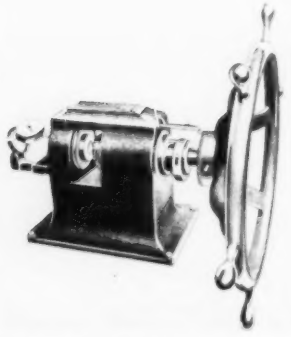


Hydraulic Machinists' Vise

Known as the No. 1004, this 4 in.-jaw vise replaces the previous 3½-in. model. It is heavier (weighs 80 lb) than previous models and possesses higher and wider jaws.

Maximum hydraulic pressure is 7,000 psi, maximum jaw pressure 2 tons. A safety valve prevents overloading. Jaw closing speed is ⅞ in. per pump stroke. Full vise opening can be obtained in three sec. The vise is controlled by two pedals—one for power, the other for release. Start control is adjustable so that any work is gripped and held with a single power stroke.

The Columbia Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4, Ohio.



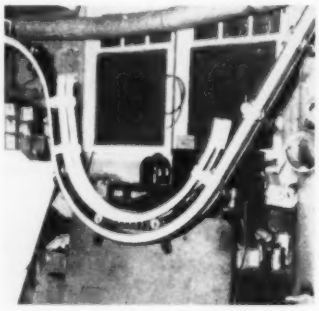
Deakin Sheet-Metal Tester Checks "Workability"

This unit is used in making the Erichsen test. This test determines the actual workability of ferrous, nonferrous, and fine metal sheets and strips to the point of fracture. It will handle material up to 5/64-in. thick.

The test piece is clamped between two dies and is held so that the metal has play and can flow, while a round-end tool is moved forward gradually by the handwheel until fracture occurs. The operator constantly observes the image of the test piece in the mirror, and when fracture appears, the depth of the impression is read directly from a micrometer scale. Readings are accurate to 0.0004 in. The depth of impression required to obtain fracture represents the "standard value," which is the basis of workability of metal sheets.

Test pieces of 3½-in. square and sheets or strips up to 2 7/16 in. wide can be tested with standard tools. Additional interchangeable tools can be supplied for checking narrow strips up to 25/64, 3/4, and 1 in. wide, for coin blanks and to determine the deep-drawing value of the material.

J. Arthur Deakin & Son, 130-28 Hillside Ave., Jamaica 2, N. Y.



Shuler Overhead Conveyor Makes Sharp Turns in Little Space

The trolleys on the Econ-o-veyor have two vertical wheels and a single horizontal wheel, with successive trolleys connected together by a heavy roller chain. The track consists of two T-sections running side by side with a vertical trolley wheel carried by each T-section, and the horizontal wheel running between the sections. On turns a third T-section is placed above the outside T and the chain pull is distributed almost equally between the three wheels.

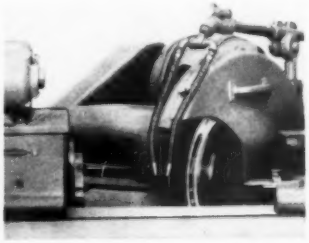
This prolongs the life of the wheels and gives full rolling contact at all points without the use of the usual traction wheels or roller turns. The chain pull is in line with a vertical wheel so that the chain does not have a tendency to rock the trolleys, as is prevalent in older types of overhead conveyors. This makes for low chain pull with resulting low power consumption and long life.

The flexible construction of the conveyor enables it to make sharp turns in both vertical and horizontal directions, to twist around existing objects, and run from floor to floor.

The photo shows a vertical dip for moving work into and out of a degreasing operation with tank removed to show how little room is required. There is no waste of plant space in long approach and take-out runs, or long, expensive tanks.

The conveyor is recommended for light to medium loading and trolleys are placed on 12½-in. centers. Load bars may be placed between trolleys to carry double loads, or racks may be used to carry a large number of small items.

Shuler Conveyors, Inc., 43 Hutcheson Place, Lynbrook, N. Y.



Tension-Wound Coolant Tubing

Sealflex metallic tubing is tension wound in such a way as to completely seal itself to carry oil, coolants, and solvents without leaking. It will bend to any position and stay put without support.

It is available in five sizes and can be provided with male or female couplings, nozzles, stopcocks and unions, or fitted to customer's specifications.

Vermont Flexible Tubing Co., Lyndonville, Vt.

Riv-It-Clip fastener quickly assembles sheet-metal parts. It is a one-piece part, with two half-round legs that fit through the two parts to be fastened and a V-shaped, notched portion on top that is clinched with pliers. As it is clinched, the legs draw apart, forming a vibration-free joint.

Robin Products Co., 14335 E. 8-Mile Rd., East Detroit, Mich.

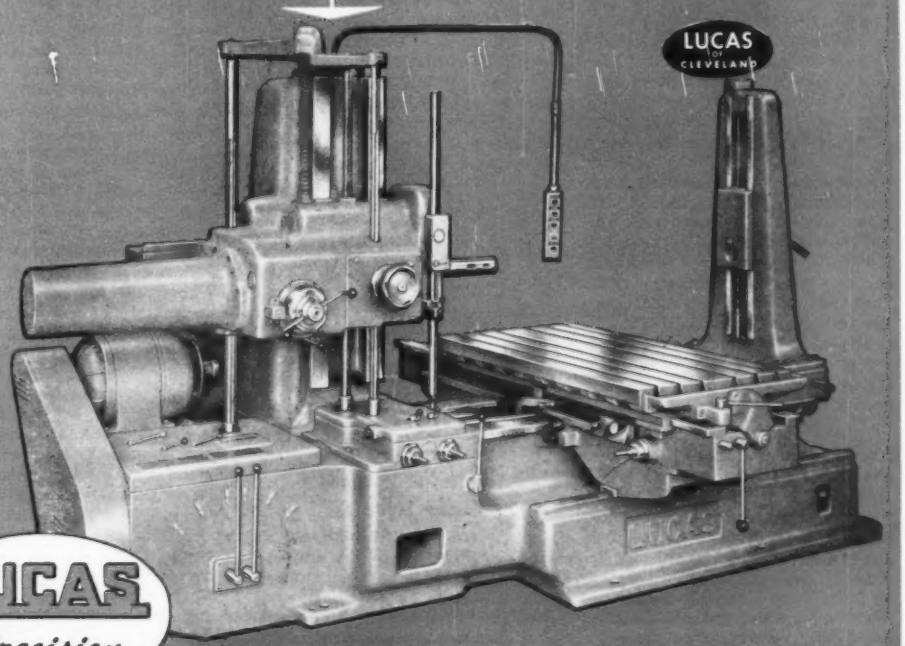
The Condensifilter removes water, oil, sludge, and other foreign material from compressed air. It combines in a single unit a dehydrator, a mechanical filter, and a self-purging pump. Mainly used to provide clean, dry air for instruments, it measures 15 in. high x 9 in. in dia and has a capacity of 30 cfm at 100 psi.

Hankison Corp., 217 Renton Bldg., 1501 Beaver Ave., Pittsburgh 33, Pa.

These *Big improvements* in boring machines have been Lucas Features *for years*

Every advancement of importance to be found in *any* boring mill is obtainable in a Lucas. In many cases Lucas has been years ahead, and some very important developments can be found *only* in Lucas machines. Fifty-one years of specialization on one product has made Lucas the first name in its field.

- Automatic power positioning
- Integrally cast four way beds with 4 point support
- Complete range of feeds and speeds to one spindle
- Pendant control
- Vibrationless V-Belt drive to spindle at high speeds
- Complete line of attachments
- Hardened ways
- Chrome plated lead screws

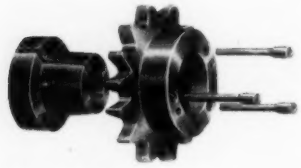


LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

Spring-type blades are used to assure good contact in electrical plugs now being offered to manufacturers for replacement and original equipment. The blades are bowed out in both directions to insure connection, regardless of where contact is located in the receptacle. Flexibility of the blades also prevents the plug dropping out of loose receptacles. The Waldron blades and plugs have been approved by Underwriters Laboratories.

Laminated Metals Products Corp., 9993 Broadstreet, Detroit 4, Mich.



Roller-Chain Sprocket Fits on V-Belt Sheave

Fort Worth has developed an interchangeable sprocket to fit their QD V-belt sheave hub so that their distributors can give immediate service without reboring sprockets as well as V-sheaves.

The sprocket is taper bored to receive the tapered hub. Bolts pull the sprocket on to the tapered split hub for a tapered drive assembly and a positive press fit on the shaft. Tapped holes in the sprocket permit the use of pull-up bolts as jack screws to break the tapered fit when dismounting the sprocket. A set screw over the keyway holds the key in position.

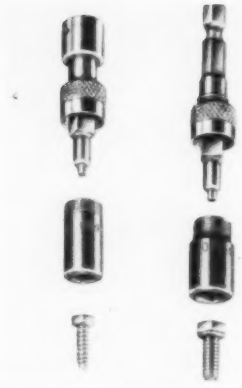
Maintenance and break down time is reduced as the sprockets can be removed or installed quicker than the conventional type.

They are available from ½ through 1¾ in. pitch.

Fort Worth Steel and Machinery Co., Fort Worth, Texas.

The Di-Acro Quick-Lok Clamp is available for No. 2 and No. 3 Di-Acro Benders. It is readily mounted on the bender base by bolts. The quick-acting clamp is said to be ideal for use when bending tubing, angle, channel, and extrusions as it securely locks these materials during the forming operation, assuring a perfect bend. Wide opening jaws allow for easy removal of the formed part. It is adjustable up to a radius of 9 in.

O'Neil-Irwin Mfg. Co., Lake City, Minnesota.



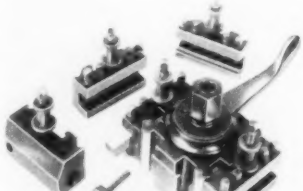
Magnetic Driving Assembly For Power Wrenches

Assembly has low-cost replaceable sockets for self-tapping and sheet-metal screws. An Alnico magnet is used in the driving member. When worn, the relatively inexpensive sockets can be quickly replaced without damaging the magnet.

The socket is driven by the squre end on the shank and is held on the shank with a left-hand thread.

The tool always delivers max. power to the screw head because the spring-loaded magnet never allows an air gap. The magnetism is transmitted through a hardened-steel tip which retracts so that driving pressure is applied against a shoulder in the socket instead of the tip.

Magna Tool Corp., 779 Washington St., Buffalo 3, N. Y.



Dimco Universal Toolholders Fit Any Engine Lathe

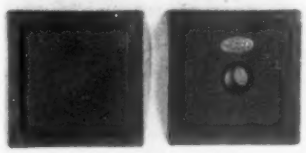
Made in two sizes, the Dimco universal toolholder has been designed to fit any engine lathe for production runs. It permits the operator an unusual amount of flexibility with complete accuracy in changing multiple-tool setups.

It consists of a main center section which is fixed in position on the compound, and may be rotated through 360° for a setup for any series of operations. Once the center section of the toolpost is placed for the operation there are three possible positions for any of the tool setups, since there are slides on two sides of the main section, and a set of slides in front.

A 5-tool setup is furnished for each tool post, consisting of a Morse taper hole for drill chuck or boring bar, a V-setup for holding a round bar, and three setups for square or rectangular shapes.

The holder is provided with a quick-change cam action to permit interchanging of setups in a minimum of time between operations. Extra tool setups are available.

Kelvin Systems Corp., 53 Water St., South Norwalk, Conn.



Incompressible Shock Absorbers Use Minute Layers of Oil and Air

Movacos, molecular vibration absorbers, neutralize the destructive forces of high-frequency vibration by increasing the time of passage of a shock and thus decreasing its force.

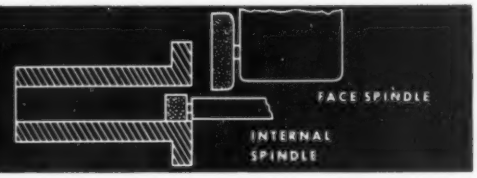
A typical model consists of 50 thin disks or sheets of copper hermetically sealed in a welded metal jacket. The disks are coated on both sides with a film of oil five molecules thick and arranged in a stack. When this stack is compressed under a pressure of 25,000 psi, it becomes a seemingly solid piece of metal, about a ¼ in. thick. But between adjacent copper sheets, held in place with the aid of the oil films, there remains a layer of air about a quarter millionth of an in. in thickness. These air molecules rebound between the disks, 500,000 times with each impact, to absorb its mechanical energy as heat instead of transmitting it as a shock. The heat, appearing in the air films and in the metallic sheets, is radiated away from the absorber.

The absorbers can be obtained in many sizes, from 3/16x1x1-in. flat mounts with no housings to a special absorber for both vertical and horizontal shock containing three 4x4 in. pads.

MVA Corporation, Cleveland, Ohio.

GRIND Holes and Faces with ONE Set-Up on FORTUNA SIP Internal and Face Grinders

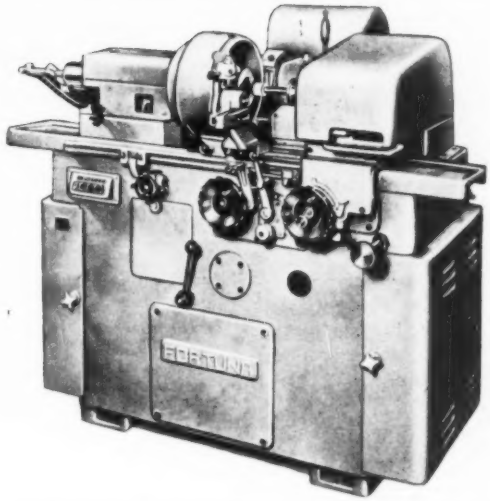
For Production Line or Tool Room Use



Designed for precision grinding at high production speeds the Fortuna SIP has . . .

- Two rigidly constructed Spindle Head Stocks for internal and face grinding operations.
- Hydraulic table movement.
- Hydraulic feed for internal grinding spindle.
- Centralized controls for ease of operation.
- Semi-automatic, cam controlled feed for production grinding, furnished when required.

Important for production or tool room work are the two spindles for grinding holes and faces of the work pieces with the same set-up and for grinding the faces accurately at right angles to the bores.



CAPACITIES AND SPEEDS

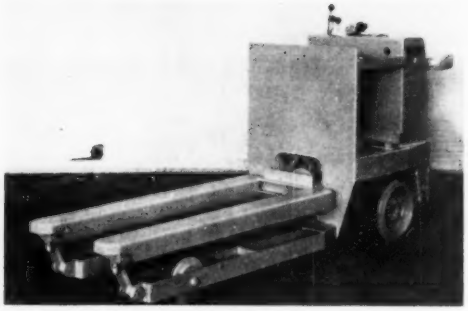
	SIP III	SIP IV
Maximum diameter of work piece or chuck	12-1/2"	12-1/2"
Maximum diameter of work piece with collet	7"	10-5/8"
Maximum swing	14"	14"
Maximum grinding depth	7-7/8"	7-7/8"
Minimum grinding diameter	5/16"	15/32"
Maximum table travel	14"	14"
Table speeds, stepless hydraulic regulation—inches per minute	12"-470"	12"-470"
Minimum feed for internal grinding spindle	.00004"	.00004"
4 workpiece speeds	80-435 r.p.m.	70-400 r.p.m.
Hole in work head	7/8"	2-3/8"
Swivel of work head for grinding tapers on work pieces up to 8-1/4" diameter	10	10

For complete details send for descriptive literature

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.



Power Truck has Divided Platform For Carrying Wheeled Containers

This power truck may be used in an ordinary manner in handling skids and tote boxes or it can be used to carry wheeled buckets, buggies, etc., with part of the load suspended between the platforms.

The dual purpose was achieved by dividing the forward trail axle. Each of the two trail wheels has a separate axle mounted in its individual frame. The two parallel frames are strongly built, reinforced and welded to the truck body. The platforms are joined at the ends, enabling them to be raised or lowered as a unit. Their forward ends are connected to the wheel frames by forged steel links.

The platforms are formed of heavy-gage steel plate with deep flanges for extra strength. They are $6\frac{3}{4}$ in. wide, 63 in. long, placed 14 in. apart. Lowered they are $10\frac{1}{2}$ in. above the floor; they can be raised another 15 in. Power is either electric or gas-electric with capacities of 2000, 4000, and 6000 lb.

Elwell-Parker Electric Co., Cleveland, Ohio.

Short-Line Phone System Operates Without Batteries

These shop phone systems derive their power directly from the voice itself. The ringing signal is produced by a simple press-lever system. Because of the low power requirements, the system is safe in locations where inflammable materials are used or stored. The limit of the system is a range of 20 miles.

Since no external sources of power are used, all transient noises such as crackling and frying are eliminated.

Three systems are available. They are: (1) The Pair-Phone system with a capacity of two phones; (2) The Master Phone system with one master station and up to 11 outlying substations; (3) The Multi-Service system with up to 12 master stations.

Wheeler Insulated Wire Co., Inc. Div., Sperry Corp., Waterbury 20, Conn.

A high-speed power hacksaw blade, called Powerflex, is made of three separate pieces welded together. The back is tough steel for shock absorption, the middle is medium-hard steel for more power and straighter cutting. The cutting edge is hard and tough for long-lasting sharpness. The blade is said to eliminate tooth stripping under normal conditions. It is available with four, six, or ten teeth per in. Lengths: 14, 18, 21, and 24 in.

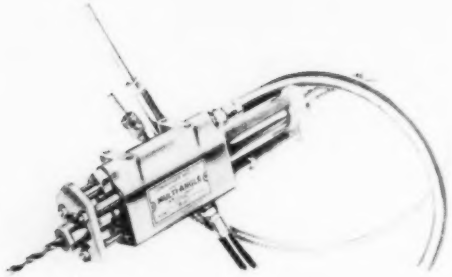
John H. Graham & Co., Inc., 105 Duane St., New York, N. Y.

Roller chain can now be easily disassembled, repaired, or connected by the use of a Baldwin-Rex chain vise. The vise makes it possible to take apart single- or multiple-strand roller chain in a few minutes. Approximate adjustments are made before the chain is inserted, permitting rapid clamping.

Baldwin Duckworth Div., Chain Belt Co., Dept. PR, 369 Plainfield St., Springfield, Mass.

Line of vibration isolators cover new load ranges of 8 to 16 lb, 14 to 25 lb, and 22 to 35 lb. Known as All-Metl Barrymounts, they consist of a load-bearing spring, friction-damping wire mesh and snubbing wire mesh with a metal housing. The units have center studs which may be attached directly to the equipment instead of requiring dimples at the mounting holes.

The Barry Corp., 803 Pleasant St., Watertown 72, Mass.

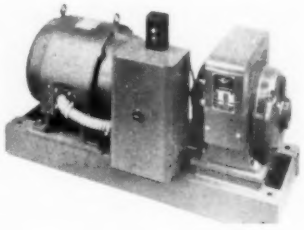


Commander Drill Unit Has Hydraulic 4-in. Stroke

The Multi-Angle is a compact drill-head which can be easily mounted on jigs and fixtures or built into special machines. It is powered by a heavy-duty flexible shaft with hydraulic actuation of the full 4-in. stroke.

Quick, easy setups and infinite adjustments in drilling position are other features. Because of their compact design, a number of the units can be mounted on a jig or fixture to drill multiple holes in a single piece with savings in time and production cost.

The Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24, Ill.



High-Cycle Motor-Generator Set Powers Hand Tools

This mono-coil, high-frequency motor-generator set is used to convert 60-cycle current to 180- and 360-cycle frequencies. It is used in plants where high-cycle automatic electric hand tools such as grinders and buffers are employed. The sets are self-exciting and have built-in voltage regulation which automatically compensates for fluctuations in voltage to the load. They are compact and easily installed.

The unit shown is 6 kw, 360 cycles, 3600 rpm. Many other ratings and speeds are available.

Electric Machinery Mfg. Co., Minneapolis, Minn.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

• ESKILSTUNA

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

Originators of Chromium Plated Gage Blocks

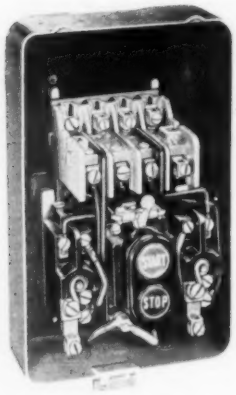
Peg-Rack Truck

Armatures, rotors, and gears can be carefully moved from one operation to another on this peg-rack truck. The parts hang on cushioned racks inclined at 15° and separated from each other.

Construction is heavy steel, all welded and furnished with 5- or 6-in. rubber-tired casters. Each truck has 90 pegs that are 7-in.-long, ⅜-in.-square steel bars covered with ¾-in. fibre tubing with beveled ends. Leather belting at the bases provides cushioning.

The trucks can be furnished with fewer pegs, spaced farther apart, for carrying large parts.

Lloyd Engineering Co., 59 Stephen St., Belleville 9, N. J.

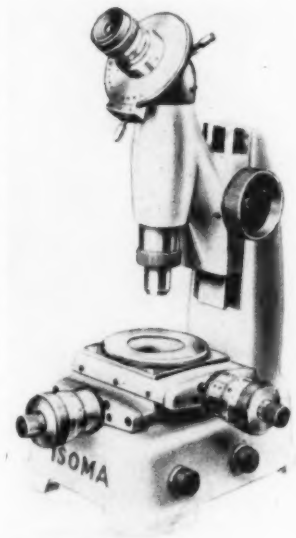


Furnas Magnetic Starter In Size Between Nos. 1 and 2

Rated at 10 hp, 220-550-v, 3 phase a.c. this is neither a No. 1 or No. 2 starter in the regularly designated size pattern, but an in-between size with a price advantage. Heretofore, when a 10-hp starter was required, it has been necessary to buy the No. 2 size rated up to 25 hp, and to pay for this extra capacity.

The series (YE) has renewable, rectangular contacts of special silver for max. arc-quenching properties and low contact resistance. The terminal boards are molded of arc-resistant alkyd and equipped with pressure connectors. It measures 6¼x10¾x4¼ in.

Furnas Electric Co., 1044 McKee St., Batavia, Ill.



Toolmaker's Microscope Measures Small Parts

The Isoma Toolmaker's Microscope designed for measuring extremely small machine parts and similar items is now being imported into this country.

These microscopes have interchangeable objectives for 20x, 30x, 50x, or 100x magnification. Other features include a 360° angle-measuring device, fully graduated and numbered every 10 minutes adjustable illumination; and support and holding accessories. The micrometer spindle is calibrated in 0.005 and 0.00005 in.

Two models are available. Except for size of object table and spindle travel, both are of identical construction; objectives and accessories are interchangeable. The object table of M-101 is 3¼-in. square; crosswise and lengthwise travel of micrometer spindle is 11/16 in. The object table of M-102 is 3 7/16x3 3/8 in.; spindle travel lengthwise is 1¼ in., crosswise — 1 3/16 in.

Included as standard equipment is a built-in transformer for 110 or 220 v, underneath light, angle-measuring device, specimen support with spring clamp and 30x objective. It is imported by:

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

Raymac Carbide Drills Cut at Low Temperatures

Raymac carbide drills are said to be able to drill a more accurate and cleaner hole at lower temperatures and lower speeds with a resulting gain in drill breakage and drill point life.

The drill does not fuse through metal but cuts, proven by the chips turned out, undiscolored by heat. The high efficiency of the drill derives from the shape of the flute and the way the drill is pointed.

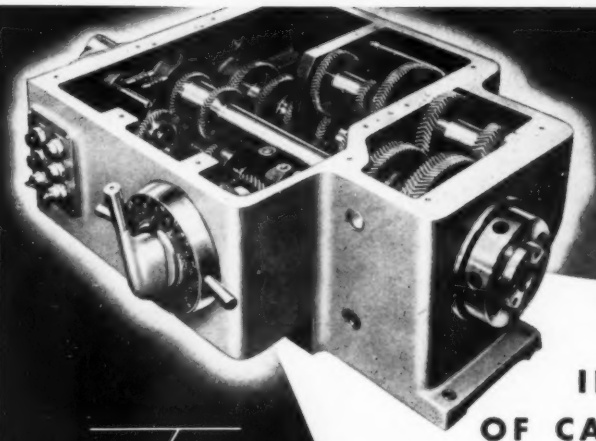
Raymac Mfg. Co., Inc., 3729 Cass Ave., Detroit 1, Mich.

Compound is used for the emergency surface hardening of small tools or parts with an ordinary torch. Known as Instant Hardener No. 1, it hardens steel tools, parts, edges, threads, dies, etc. Instant Hardener No. 2 is applied in the same manner as No. 1, but is strengthened with small hard-facing particles mixed into the compound. These hard particles, when heated, fuse with the parent metal to give a combination of hardening and hard overlay — protecting a plate, for example, against abrasive wear, etc.

Eutectic Welding Alloys Corp., 172nd St. and Northern Blvd., Flushing, N. Y.

Conveyor-belt cleaner uses self-aligning, spring-steel wiper blades, set perpendicular to the belt surface, but diagonal to belt travel. Spring arms supporting the blades maintain a uniform pressure on the belt and allow the blades to easily ride over obstructions such as belt splices. Since it has an independent mounting assembly, it can be easily adapted to fit existing installations. Adjustments and replacements can be made from either side without interrupting conveyor travel.

Stephens-Adamson Mfg. Co., Aurora, Ill.



Sidney Lathes

INCREASE LIFE OF CARBIDE TOOLS

The continuous tooth contact of Sidney's All-Herringbone Geared Headstock produces a smooth flow of power and creates pressure of constant intensity on the cutting tool . . . This constant pressure is especially desirable when using carbide tools by preventing tool breakage caused by shock or intermittent pressures.

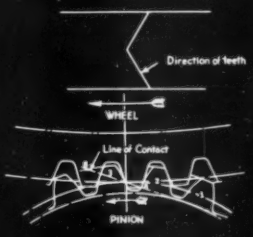


FIG. 9
VIEW IN PLANE OF ROTATION

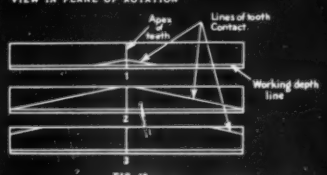


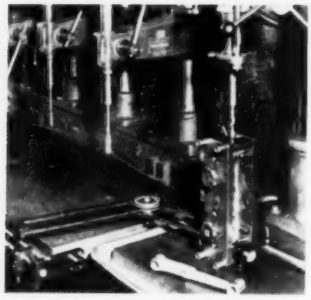
FIG. 10
DEVELOPMENT OF TEETH IN CONTACT.

Illustrated at left is the nature of contact between two herringbone gears. Pressure is evenly divided over three teeth with no tendency for tooth contour to wear unevenly. Full descriptive bulletin available.

SIDNEY MACHINE TOOL COMPANY

Builders of Precision Machinery Since 1904

SIDNEY, OHIO



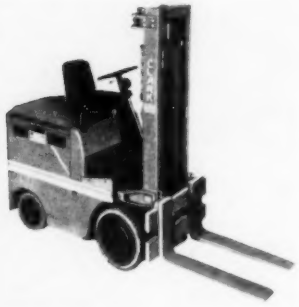
Torque-Absorption Device Can be Moved From Spindle to Spindle

Torkarm, a device that absorbs torque on drillpresses and tappers, now has a front Torkrail unit. It allows the Torkarm to be moved from spindle to spindle on the Inline multiple-spindle drillpress.

The Torkrail is attached to the front trough of the Inline. One or more saddles are mounted on the unit, a Torkarm riding each saddle. As work is completed under each spindle, the Torkarm rides down the rail to the next. There is no limit to the number of holes or their position in the fixture which can be completed under each spindle. Using a workplate with "jig pins" or the Torkarm Quic-Clamp, tumble jigs can be readily used.

The Torkrail unit comes in two sizes. Series 300 for work up to 1½ hp, Series 500 for heavy-duty work.

Torkarm Corp., 2912 Emerson Ave. S., Minneapolis, Minn.



Clark Improves Carloader Fork-Lift Trucks

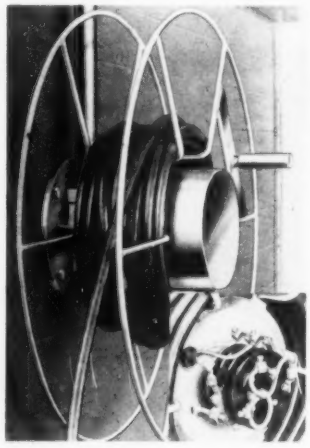
A number of improvements have been incorporated into Clark's electric Carloader and are claimed to provide easier operation, greater safety, and improved maneuverability for its 4- and 5-thousand-lb-capacity fork-lift trucks.

Operation is simplified by mounting "fingertip" control on the steering column to provide direction selection and power engagement simultaneously.

Automatic acceleration eliminates jerky movement. Shifts from one point of power to another are timed automatically in accordance with torque requirements. The steering axle is pivoted on rubber torsional bearings. For safety, the brake is automatically set when the driver's seat is unoccupied.

Design changes were based on specifications for a smaller turning radius, higher traveling speeds, and faster lifting speeds.

Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.



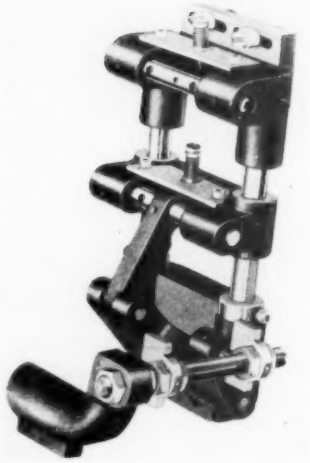
Wall-Mounted Power Reel

Compact reel can be permanently mounted in or on trucks, walls, and other places to make handling of heavy electrical cable easier.

A mounting flange on the side is fastened to a base by four ⅜-in. bolts. The flange is threaded to fit a 1-in. iron conduit or to form a connection for flexible feeder cables. The reel will accommodate sizes up to No. 4, four-conductor cable.

A collector-ring assembly is standard so that no interruption in current results from winding or unwinding the cable. The rings are of heavy beryllium copper with double contact brushes seated in a phenolic casting and housed in metal. The reel is available in any size with either a 75-amp collector ring for 2, 3, or 4 conductors—or a 30-amp ring for up to 16 conductors. The cable is attached to screw binding posts.

Industrial Electrical Works, Dept. 10, 1511 Chicago St., Omaha 2, Neb.



Producto Automatic Feed For Stamping Presses

Any ordinary press can use the Surefeed. It is mounted directly on the die set—no press attachments or alterations are required. Stock up to 2 in. wide and 0.045 in. thick can be handled.

Features include: (1) Adjustable hardened and ground tool-steel cams can be reversed giving extra-long wear. (2) Oil holes for proper lubrication are located at every slide or bearing point. (3) No springs, cams, or fancy mechanisms for feeding—only two drive plates and simple linkage, controlled by the movement of the press. (4) Pilots and other positioning means can be used and are recommended for exact register of stock.

For feed lengths over ⅞ in., a removable stop is available as optional equipment. Weight of the Surefeed is 10 lb.

The Producto Machine Co., Bridgeport 1, Conn.

Handling tools for instrument ball bearings are now available to eliminate the corrosive effects of finger handling of bearings. The tools are essentially special tweezers for use on bearings having bores from 3/32 to ½ in. They are said to be practical during inspection, cleaning, and relubrication operations and are supplied in two models—one for gripping the bearing by the inside race and the other for the outer race.

The Baker Co., Maplewood, Maine.

NEW SHOP EQUIPMENT

(Continued on page 196)

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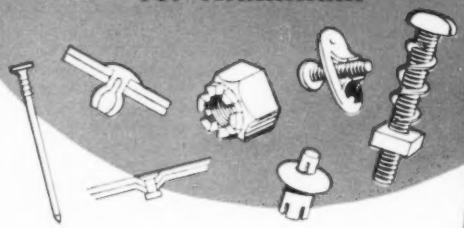
"Fastening Methods for Aluminum"



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All you need to know about fastening aluminum components

This 136-page illustrated booklet is a *must* for your desk reference library. All the very latest information on the wide variety of mechanical fastening methods used to join assemblies involving aluminum parts.

There are tables of related data for the various types of standard rivets, including dimensions and number of pieces per pound, lengths of rivets for cone-point and button-type driven heads, recommended hole sizes with shear and bearing areas for both hot and cold-driven rivets, and maximum loads for single rivet in shear.

Answers your questions on standard and special rivets, standard and special screw fasteners, nails and pins, metal stitching, mechanically formed joints, resin bonding and others.

Application of these latest 1951 fastening methods speeds production, means increased capacity and lower costs for you.

And if you have a *special development* problem, take advantage of the trained staff of Reynolds aluminum specialists waiting to help you. Let them show you how to overcome difficulties and set-up for fast, economical production. For prompt service, call the Reynolds office or your distributor listed under "Aluminum" in your classified telephone directory.

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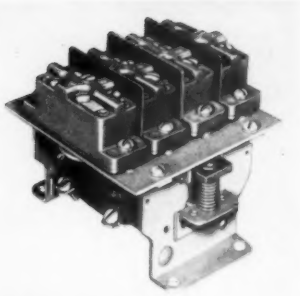
SIMONDS ABRASIVE CO.

Grinding Wheels

Production up! That's the bulletin board's big news... good news that started when Simonds Abrasive Company wheels went to work in the grinding department. Simonds complete line includes wheels accurately specified for top results on *your* jobs . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for free data book and your distributor's name.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd. Arvida, Que.



Square D 4-Pole Relay Allows for Variable Circuit

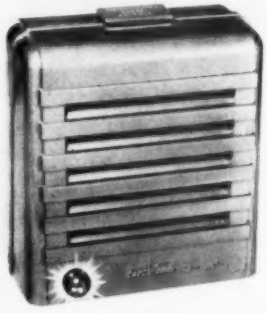
A four-pole relay from Square D makes available a line formerly obtainable in a maximum of three poles. It is well suited for control assemblers, having all terminals exposed, being easily accessible, and occupying only a small space on the panel.

The device has four normally-open and four normally-closed contacts, allowing the circuit arrangement to be changed merely by changing the incoming wires to different terminals. When used in circuits of the same polarity, four normally-open and four normally-closed contacts are available.

Each of the four snap-action contact mechanisms is self-contained and easily removed. All contacts are silver-to-silver.

The relay is rated 10 amps non-inductive, with inductive ratings of five amps at 600 v, 15 amps at 110 v. Coils are available for 6-600 v, 25-60 cycles.

Square D Co., 4041 N. Richards St., Milwaukee 12, Wis.



Intercom Staff Station Combines Privacy and Remote Operation

The user of this Executone intercom staff station can be up to 30 ft

WHY DO FORGEMEN LIKE THE NEW MAXIPRES?

Because NATIONAL has engineered *23 distinctly new forging press features* into the new MAXIPRES, including:

Disc Brake
Water-cooled, trouble-free.

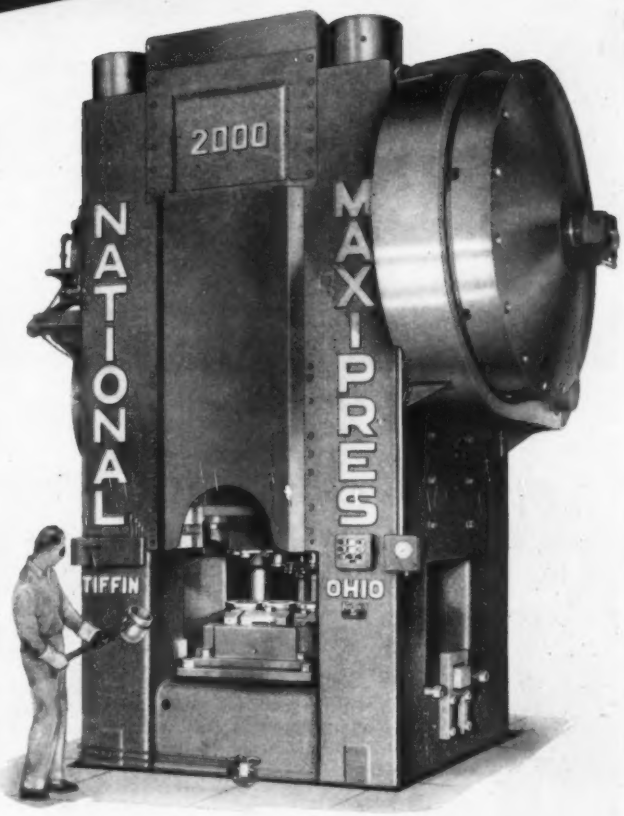
High-Capacity Clutch
Indestructible driving keys, 23% more ability.

Bigger Eccentric
Shaft strength 30% greater.

Tonnage Indicator
Blow-by-blow reading in tons.

Most modern forge shops have always preferred the MAXIPRES for its rugged construction and reliable operation, *plus* NATIONAL'S superiority in die design and service.

Now—the *new* MAXIPRES, *designed for the times,* is ready to fulfill the expanding requirements of the fast-moving forging industry.



MAXIPRESSES are available in 13 sizes from 300- to 8,000-ton.

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DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

Hartford Detroit Chicago

Tippy Says: ST. GEORGE FROM THE DRAGON HAD NOTHING TO FEAR FOR HIS ARMOUR WAS WELDED, YOU CAN BE SURE!

Tippy Says: . . . Take a tip, try TIPALOY!

You will have nothing to fear if you use GOOD welding electrodes!

The finest Resistance Welding Electrodes available are . . . TIPALOY! . . . they are fabricated to wear and wear . . . give you longer life, less redressing, less mushrooming and cut production costs. You have used ordinary welding electrodes long enough . . . switch to TIPALOY Resistance Welding Electrodes today!

Write today for test samples and "the story of STRAIGHT LINE conductivity!"

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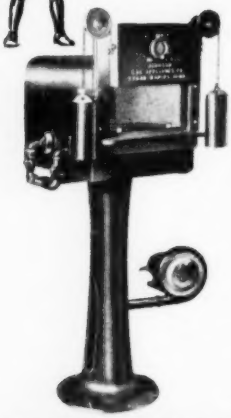
No. 7 of a Series — Branches in All Principal Cities

STOP WASTING TIME

Heat Treat High Speed Steels in Your Own Plant with . . . . *Quick Acting* JOHNSON Furnaces



Save time, save gas . . . get the job done without delay with JOHNSON'S Hi-Speed No. 130A. Made in two temperature ranges. Four-burner unit for steels requiring 1400° to 2350° F. Six-burner for 1800° to 2400° F. Temperatures easily regulated with accuracy. Automatic controls available. Powerful burners fire under hearth assuring fast, uniform heat. Brazes carbide tool tips. Hardens small metal parts. Firebox 7" x 13" x 16½". Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower. Write for complete catalog. Johnson Gas Appliance Company 509 E Avenue, N. W., Cedar Rapids, Iowa.

JOHNSON No. 130A Hi-Speed

4-Burner $295.00
6-Burner $325.00

F. O. B. Factory

Also available in smaller sizes

JOHNSON

FURNACES FOR INDUSTRY

away from the station, and hear and reply to all incoming calls without stopping his work to approach or operate the station. At the same time, he is protected against eavesdropping: the instant a master station opens the line, a plainly visible red lamp, located on the staff station, illuminates brightly—notifying the user that the line is open.

The staff station is 6½-in. high, 6-in. wide, and 3½-in. deep at the base. It is made of die-cast metal construction and is finished in metalustre bronze.

Executone, Inc., 415 Lexington Ave., New York 17, N. Y.

Spacemaster Truck For Minimum Operating Space

The Spacemaster 61 is a heavy-duty high-speed truck designed for warehouse operations where minimum space is one of the prime requirements. It will carry and high-stack loads up to 3000 lb 48-in. long. Pallets 40-in. long can be right-angle stacked in a 10-ft aisle; this includes the recommended clearance for speedy, safe operation.

Standrive operation is used in this unit. The mast design provides 127 in. of fork elevation and 65 in. free lift with 83-in. collapsed height.

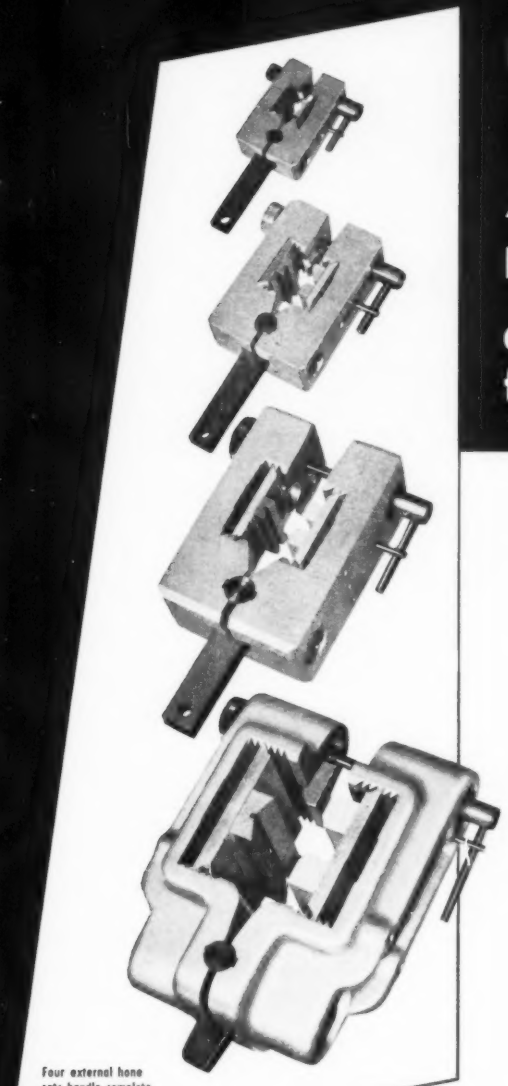
All maintenance can be handled from top side of truck. There are no grease points—sealed ball bearings and self-lubricating bronze bushings eliminate the need for periodic lubrication.

Special-purpose attachments are available. Weight of the truck is 6900 lb.

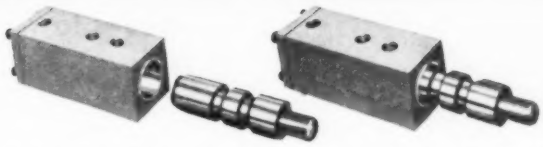
Lewis-Shepard Products Inc., 195 Walnut St., Watertown, Mass.

PERFECT PINS + PERFECT HOLES = PERFECT FITS

SUNNEN EXTERNAL HONES For Outside Surfaces and SUNNEN HONING MACHINES for the Holes—



Four external hone sets handle complete range from .120" to 2.750"



It's the New Way to Get Exact Fits Without Lapping

Now, with Sunnen *External* Hones you can match the precise accuracy and exceptionally smooth surface finish produced by Sunnen Internal Honing. These new hones *for outside surfaces* are ideal for finishing parts such as valve pistons, pins, arbors, plungers, ejector pins, spindles and shafts. Diameter range is from .120" to 2.750".

Sunnen External Hones are the *only* external hones with extension holders designed for removing heat treat warpage. Defects such as waviness, warpage, out-of-round, and centerless grind patterns are corrected quickly and with minimum stock removal. Accuracy is guaranteed to within .0001"—can be held to a few millionths on some jobs.

TYPICAL APPLICATIONS

Needle Valve Metering Rod Valve Spool Ram

To find out more about the benefits of using Sunnen External Hones in your plant, send the coupon for FREE illustrated booklet.

SUNNEN PRODUCTS COMPANY
7926 Manchester Avenue • St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

To: SUNNEN PRODUCTS CO.
7926 Manchester Ave., St. Louis 17, Mo.

☐ Please send bulletin on external honing. ☐ Have representative call.

Name.....

Company.....

Address.....

City.....Zone.....State.....

Increase Tool Life

...Here's **HEAT TREAT** equipment to make tools more productive

Packed with helpful information, Bulletin SC-151 tells how 'Surface' Standard Rated Furnaces are applied to tool room heat treat needs.

ATMOSPHERE FURNACES

Balco, Char-Mo, Atmotrol for clean, scale-free hardening, gas carburizing and dry cyaniding.

MUFFLE FURNACES

For use with protective atmospheres to prevent scaling and decarburization.

POT FURNACES

For hardening, cyaniding, liquid carburizing, drawing or interrupted quenching.

OVEN FURNACES

For direct-fired general heat treating or heating operations.

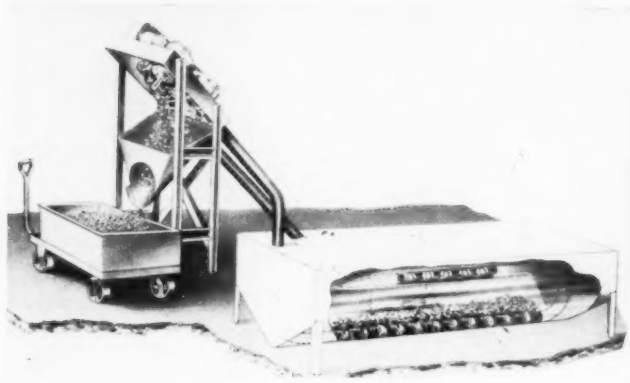
CONVECTION FURNACES

For drawing or tempering of tool steels.

'Surface'

COMBUSTION CORPORATION

TOLEDO 1, OHIO



Automatic Coolant Clarifier Functions in Timed Cycles

The removal of abrasives and other solid contaminants from coolants, the transportation of the waste to a disposal point, and the cleaning of the filtering screens is done in automatically timed cycles.

The equipment consists of a multiple-screen clarifier, blowdown tank with conveyor, and an automatic control panel. Particles are removed from the screens by the blowdown, they then settle in the V-bottomed tank and are removed by the chain conveyor. The conveyor is built-in and tube enclosed.

The system eliminates the need for individual coolant pumps and motors on machine tools and the labor required to clean individual sumps and lines.

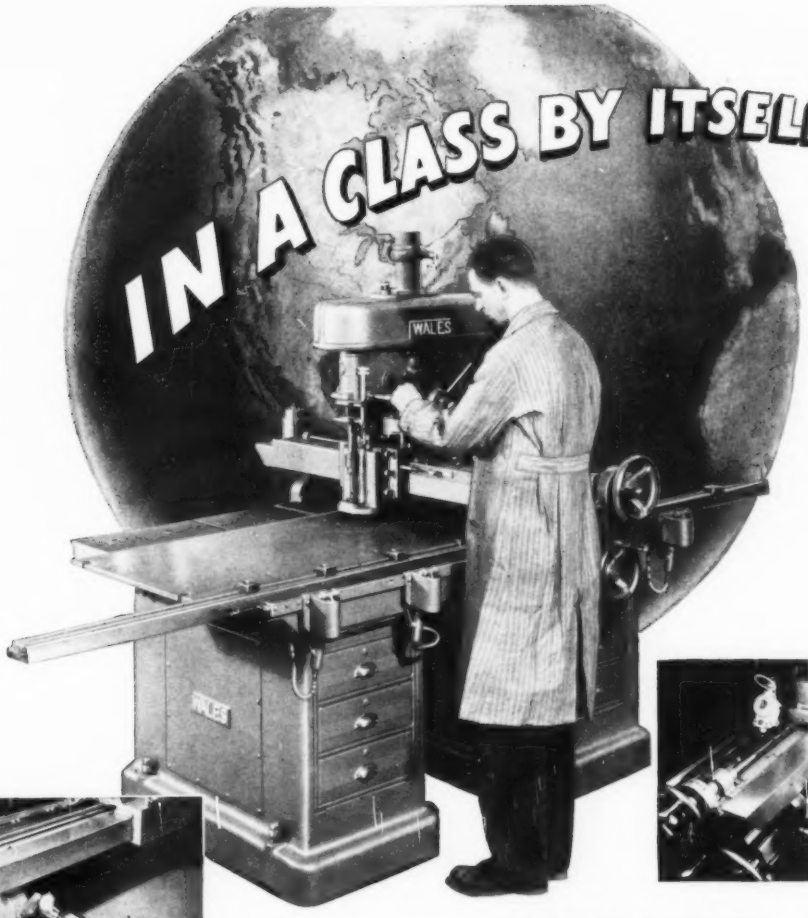
The system provides flow rates up to 1000 gpm.

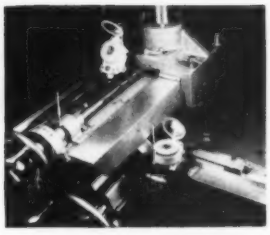
Honan-Crane Corp., 710 Indianapolis Ave., Lebanon, Ind.

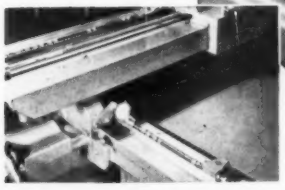
Inspection Machine Measures 28 Dimensions Simultaneously

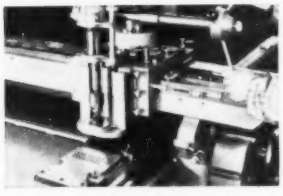
The Sigma Multi-Dimension machine checks pieces simultaneuosly for inside and outside dia's, depths, profiles, tapers, concentricity, squareness of surfaces, threads and other characteristics. Results are shown by signal lights on a panel. If it is OK within limits, a master green light shows up—on the plus side, a yellow light for each dimension—

IN A CLASS BY ITSELF

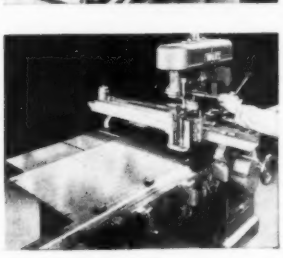








LOCATING . . . Holes are located by placing end measures in V-grooves on bridge and slide rail (or by using a precision optical gage as shown in extreme right illustration). Two speed gearing on both front-to-back and right-to-left settings provide rapid traverse for rough positioning and slow speed for "zeroing in". Air locking clamps are provided for rigid positioning on both horizontal and longitudinal planes.



DRILLING . . . Showing typical small template being drilled with drill head assembly and slide rail locked in position by air clamps.

REAMING . . . Showing hole in large template being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.

WALES
DRILLING MACHINE
For Precision Locating, Drilling and Reaming of Holes

● This exclusive Wales Drilling Machine fills a definite need. *There is no other drilling machine or jig borer like it.*

Accuracy is the primary consideration in building this specially designed and ruggedly constructed Wales Drilling Machine which combines simplicity of operation, easier locating and faster production.

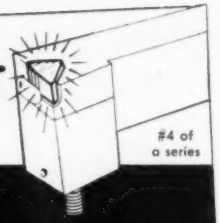
The illustrations at left show *how this Wales Drilling Machine operates.* Conveniently located built-in 1/32" scales and dial-type gages calibrated in ten thousandths of an inch accurately locate drill head and slide rail.

For the complete story on Wales Drilling Machine, write TODAY for fully-illustrated, functionally-colored Catalog DM.

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, *Chairman*
373 **PAYNE AVE., NORTH TONAWANDA, N. Y.**
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

Tool Saving Tips

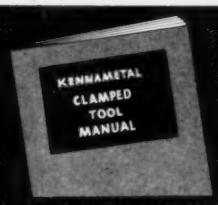


#4 of a series

KENNAMETAL TOOL MANUAL

Gives information on proper selection, application, and maintenance. Many useful tables, typical job layouts, etc. Vest pocket size.

USE KENNAMETAL SERVICE AIDS



CLAMPED TOOL MANUAL

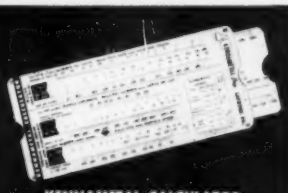
Describes and illustrates how you can make a wide variety of special purpose mechanically-held tools in your own shop. Letter size.

KENNAMILLING MANUAL

Illustrates and describes operation and maintenance of various inserted-blade cutters. Contains unique "trouble-shooting" section. Vest pocket size.

PERFORMANCE REPORTS

Contain specific data on tooling and methods used in hundreds of shops to save tools, floor-to-floor time, and grinding expense. Letter size.



KENNAMETAL CALCULATOR

Automatically correlates various factors to give proper speed and feed rates for turning, boring, milling. Eliminates guesswork and calculating. Vest pocket size.

FIELD SERVICE

Our field engineers offer you the greatest collection of carbide tooling "know how" that is available through any one source.

All these service aids are available to you to help you get more work from fewer carbide tools. Ask your nearest Kennametal representative about them, or write to us.

KENNAMETAL® Inc., Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

and on the minus side, a red light for each dimension. As man yas 28 dimensions of a turbine blade are being inspected simultaneously at 300 pieces per hr.

The machine is made up of standard units—bases, light boxes, measuring gages, fixtures, and sorters. It can be rapidly changed for inspecting different parts and can be em ployed as a hand-, semi-automatic or automatic-operated unit.

The tips of the measuring gages, workholders, and loading magazines or hoppers are the only special parts required for individual setup. With proper tooling, setups can be changed in about 20 min.

Depending upon the equipment used and the parts to be inspected, the machine will check up to 10,000 pieces per hr.

The automatic model is equipped with a device to sort the pieces into three or more groups: those that are OK, those that can be corrected, the ones to be rejected, and those to be graded.

The basic checking unit, an electric signal gage, measures repeatedly to within 0.00005 in. Movement of an anvil is transmitted through a knife edge to a small pivoted assembly to which is fixed an arm. On the outer end of the arm is a spherical contact, the movement of which is restricted by two contacts. These contacts have a screw adjustment for setting the gage to the tolerance prescribed. Precise setting is facilitated by graduations on setting drums. A knob and locknut near the bottom of the gage provides coarse adjustment.

The gages are made in four models with measuring ranges from 0.0-60 to 0.010 in. with graduations from 0.0003 to 0.00005 in. They are made in England and imported by:

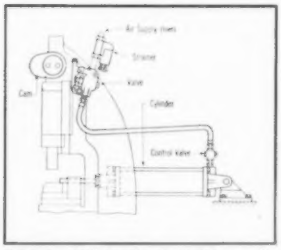
The Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

These lightweight shelf trucks can be built to meet individual requirements. They are furnished with any size or type of caster and wheel. The lips of the shelves can be supplied turned up or turned down, a feature that makes this truck especially useful for handling various kinds of material.

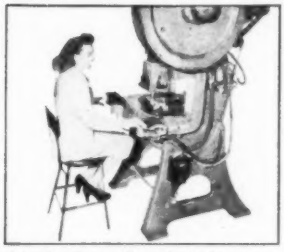
Materials Handling Div., Market Forge Co., Everett, Mass.

A noisless air vibrator latest in the Cleveland line, is for use at close proximity to employees. The reciprocating action of a hard chrome-

Airways to Savings and Safety via Schrader®



Schrader Cylinder Knockout Sets—are designed for ejecting work which cannot be blown from dies by an air blast. The cam can be adjusted to actuate the knockout cylinder at any point during the press cycle.

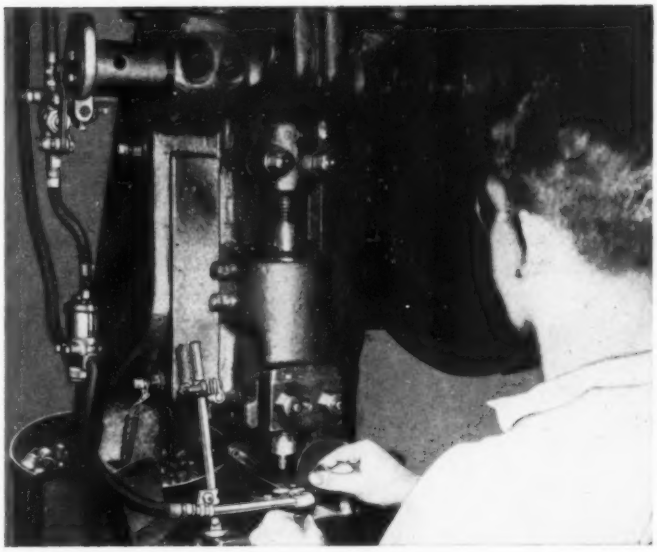


Schrader Power Press Controls—are one of the easiest ways to keep hands out of danger zones. Requires the use of two hands to operate the levers. Builds an operator-confidence that increases the flow of production.

Schrader Kick Press Controls—These controls substitute more efficient air power for foot power—thus eliminating fatigue, spoiled work. There is a Schrader control for hand operation, foot operation or both.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Schrader
PRODUCTS
CONTROL THE AIR



How Air Ejection of work can STEP UP Production and Safety

Hand removal of work is slow and dangerous. You can increase production as well as safety—right now—by installing Schrader Air Ejection Sets on your power press or on any other machine that has a moving member to actuate a cam or sliding tripper.

These Air Ejection Sets remove work from the die by an intermittent blast of air. Can be timed to deliver a blast from a fraction of a second to any desired length during or after the cycle. This method saves time and eliminates the hazards of hand removal.

Uses up to 90% less air. Schrader Air Ejection Sets cut down the wasteful flow of a steady air. In many cases air savings up to 90% have been effected by the adoption of Schrader Air Ejection Sets. Before you decide your compressors have reached their maximum capacity investigate how Schrader Controls cut down air waste.

Schrader Air Ejection Sets come assembled and ready to install. They are surprisingly inexpensive and pay for themselves in a matter of weeks.

If you have an ejection problem on any kind of machine, it can be solved easily by one of a number of combinations of cylinders and valves. So look over the machines in your shop. You'll see many places where these ejection sets are just the thing. Ask us to help you determine what will best fit your needs. Send us a letter outlining your particular installation, your idea, or fill out the coupon below.

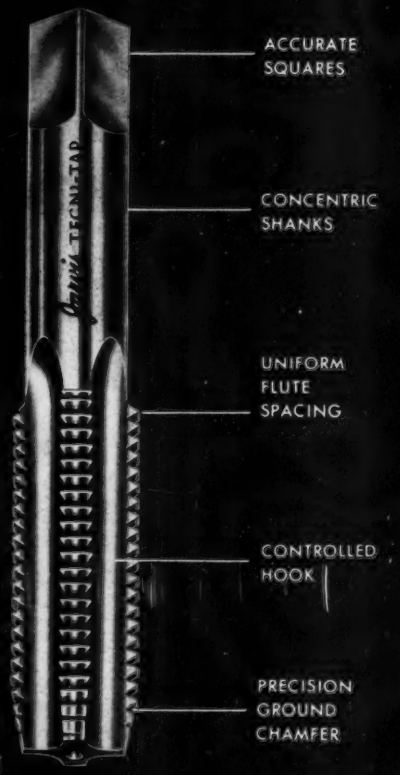
Mail this Coupon Today

A. Schrader's Son
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn, N. Y., Dept. F-2
Please send me further information on

☐ Air Ejection ☐ Cylinder Knockout Sets
☐ Power Press Controls ☐ Kick Press Controls

Name _____ Title _____
Company _____
Address _____
City _____ Zone _____ State _____

CUSTOM MADE
at NO EXTRA CHARGE



Jarvis
TECNI-TAPS

JARVIS POWER TOOLS
TAPPING ATTACHMENTS
TECNI-TAPS
ROTARY FILES
FLEXIBLE SHAFTS and
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

plated piston develops the vibrating action. Action is noiseless because the momentum set up by the piston is cushioned by a pocket of air at each end of the vibrator assembly. Speed and intensity of vibration is variable. The unit weighs 2 lb, 11 oz, and is 6½ in. long and 1½ in. wide.

The Cleveland Vibrator Co., 2752 Clinton Ave., Cleveland, Ohio

Avdel Sheet Metal Grippers Operate Without Springs

These grippers for properly holding sheet metal parts preparatory to riveting, operate without the use of springs or special tools. Drawing the parts closely together eliminates any tendencies of rivet shanks to swell between sheets and assures a properly riveted joint.

They are available in a range of hole sizes; 3/32, 1/8, 5/32, and 3/16 in. Surface area at contact points is large and smooth, preventing damage to metal surfaces. The extra grip length of shank allows for several sheets to be held together at one time. They are said to work well in blind applications.

Aviation Developments, Inc., 210 N. Front St., Burbank, Calif.

Battery-Operated Stacker Has Built-in Charger

A combination fork-lift-stacker and hand truck with elevating platform operating from a standard 6-v automobile battery is capable of moving, lifting, and stacking loads up to 750 lb.

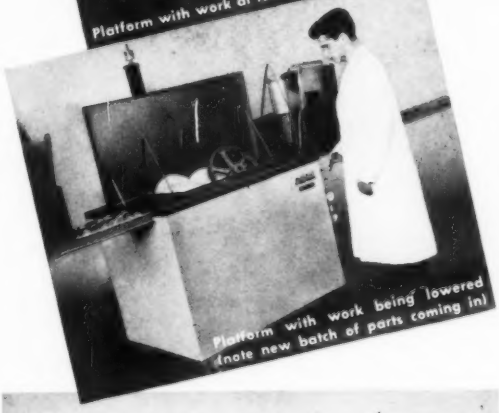
This unit has a battery-activated motor mechanism which operates the hydraulic lift. The small drain placed on the battery under capacity use is replaced by the built-in charger during off-hours.

Large load wheels in the back and

STOP BEFORE YOU BUY ANY CLEANING EQUIPMENT . . . Get the facts on the Amazing Magnus AJA-LIF Cleaning Method

FOR THESE OPERATIONS } **Alkaline or Solvent Cleaning • Removal of Buffing Compounds, Tripoli, Rouge • Cleaning before Painting • Screw Machine Chip Removal • Cleaning after Heat Treating • Quenching • Maintenance Shop Cleaning**

Platform with work at loading level



Platform with work being lowered (note new batch of parts coming in)

A production cleaning and processing set-up consisting of a series of Magnus machines

CHECK THESE MAGNUS AJA-LIF FEATURES AGAINST ANY OTHER CLEANING EQUIPMENT

- ✓ Superior cleaning with agitation
- ✓ Saves labor—one man operation
- ✓ Fits *any* production line
- ✓ On-the-Spot cleaning in any department
- ✓ Uses low-cost *available* cleaners
- ✓ Eliminates fire hazard
- ✓ No gears—no electric motors—no sprays
- ✓ Eliminates worker fatigue
- ✓ Expands to include other operations
- ✓ Saves valuable floor space
- ✓ Low initial cost—low upkeep
- ✓ Eliminates overhead conveyors; hoists
- ✓ No groping in cleaning solution for work
- ✓ Loads—unloads at top of machine
- ✓ Flexible set-up for intermittent cleaning
- ✓ One lever lowers, agitates, raises parts
- ✓ Turbulent action "shears" dirt, chips from parts

• • •

IT COSTS YOU NOTHING to investigate this new Aja-Lif equipment that may be the answer to your production problems

USE THIS COUPON TODAY

MAGNUS CHEMICAL CO., INC. — EQUIPMENT DIV.
60 South Avenue, Garwood, N. J.

Send data on Magnus Aja-Lif Method for cleaning

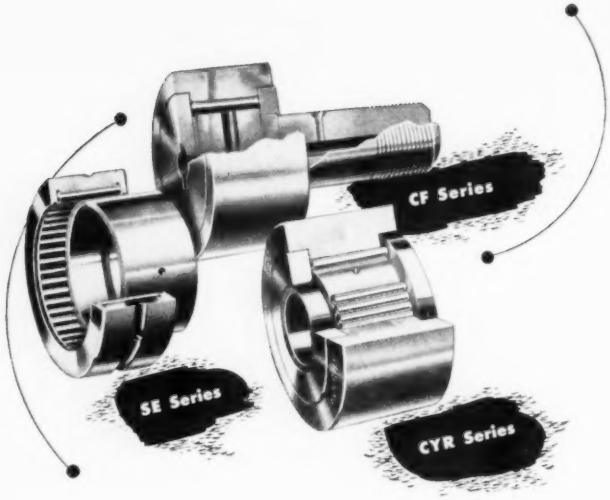
COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE ____

BY _____ TITLE _____

Please attach to your Letterhead



MULTIROL *precision*
is ***PERMANENT***

The fine precision originally built into every McGill Multirol Bearing actually lasts longer. It can easily be considered permanent by comparison because Multirol Bearings are free from early internal wear that can destroy the accuracy of friction type bearings.

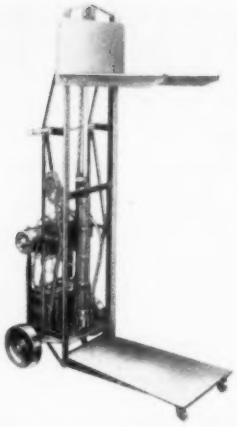
The rolling action of small diameter rollers maintaining a constantly lubricated roller line contact with raceways makes the difference — keeps the Multirol Bearing equipped machinery operating at top efficiency without costly maintenance for frequent adjustments and bearing replacement.

For the increased production demands just ahead you will need the performance extras of McGill Multirol Bearings. Adopt the SE Series for precision handling of increased loads when radial space is limited. Either the CF Series with stud or the CYR Series for shaft mounting will withstand heavy shock load in any kind of cam action application.

Write today for descriptive Multirol® Bearing Bulletins.

McGILL® precision bearings

McGILL MANUFACTURING CO., INC., BEARING DIVISION
111 N. LAFAYETTE ST., VALPARAISO, INDIANA, U. S. A.



swivel casters in the front make the unit highly maneuverable. The platform of the stacker is 21-in. long and 18-in. wide. The use of a standard auto battery and a built-in charger makes it a low-cost unit.

Clark-Hopkins Equipment Corp., 1124 Spring Garden St., Philadelphia 23, Pa.

Safety-Step Ladder Has Retractable Casters

Designed for use with stock carts this 4-step ladder has hangers that are adjustable for push-bar heights from 30 to 38 in. It is mounted on ball-bearing casters for easy movement without lifting. When the weight of the stock clerk is on the ladder the casters automatically retract, putting two rubber-tipped legs into firm contact with the floor.

The ladders are all-steel with ¾-in steel-tubing frames and expanded-steel non-slip steps, welded for maximum strength and long life.

Ballymore Co., Wayne, Pa.

They never miss this HEADLINE

and the savings in time — and screws — make news wherever they see it on P-K Size-marked Gear Grip Socket Head Cap Screws

The SIZE-MARK on Parker-Kalon Socket Head Cap Screws is something no workers can miss, whether they are beginners or veterans.

When they see it, errors and confusion are avoided. Sizes are issued correctly, used correctly—there's no time wasted checking and changing, no spoiled work.

In the tool-crib, the P-K Size-mark speeds up sorting of left-over, mixed screws, without the bother of "miking" or gauging. It puts screws back in use that might otherwise be discarded because sorting is "too much bother".

Only Parker-Kalon offers the Size-mark and Gear Grip on Cap Screws. They are wanted, in tremendous quantities, for more of industry's finest products than ever before. For DO or other assemblies, set your standards by P-K quality. Your P-K Distributor will apply his long experience to your most difficult problems of planning and procurement.

IF IT'S P-K IT'S O.K.

Parker-Kalon Corporation, 200 Varick Street, New York 14, New York.
Sold through Accredited Distributors.

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Cold-forged

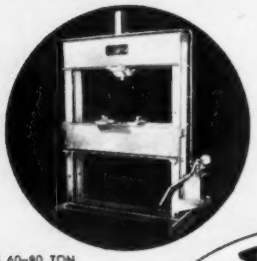
SOCKET SCREWS

SIZE-MARKED SOCKET HEAD CAP SCREWS • GROUND THREAD SOCKET SET SCREWS
FLAT HEAD SOCKET CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

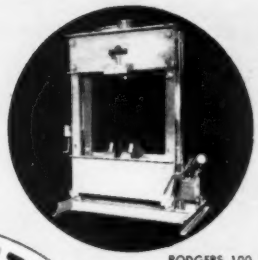
MORE HELP FOR ASSEMBLY PLANNERS

The New
P-K Socket Screw Dimension Finder

A pocket-size plastic slide chart gives you all essential dimensions of P-K Socket Cap Screws, Set Screws, Flat Head Socket Cap Screws, Stripper Bolts, and Pipe Plugs. Includes Set Screw Point Dimensions, and Thread Length Formula. Available, FREE from your P-K Distributor.

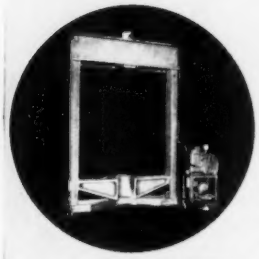


RODGERS 60–80 TON SHOP PRESS

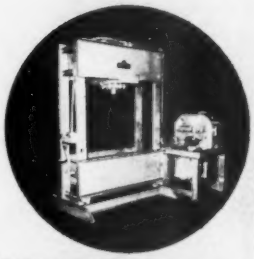


RODGERS 100 TON SHOP PRESS

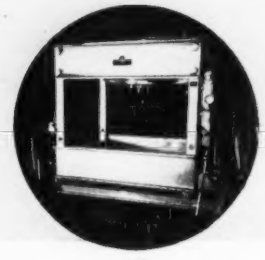
HYDRAULICS Rodgers KEEP THE WORLD MOVING



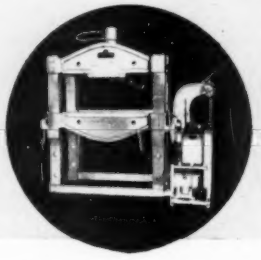
RODGERS SPECIAL SHOP PRESS



RODGERS 150–200 TON SHOP PRESS



RODGERS SPECIAL 100 TON SHOP PRESS



RODGERS 300 TON SHOP PRESS

FOR 101 UNUSUAL JOBS THERE'S NOTHING LIKE A

RODGERS SHOP PRESS

YES, a Rodgers Hydraulic Shop Press is about the handiest piece of equipment you can find for those many pressing, forming, bending and straightening jobs, for die tryout, short production runs and scores of other uses. They are versatile, time-and-labor-saving presses with construction and operating features that make them adaptable to all requirements . . . Standard model presses are available in 60, 80, 100, 150, 200, 300 and 400 ton capacities with hand or power pumps—special or modified units will be supplied to specifications.

Send for Catalog

Rodgers Catalog No. 313A has descriptions and specifications on the complete line of Shop Presses.

HYDRAULICS Rodgers

Rodgers Hydraulic, Inc.

7407 Walker St., St. Louis Park, Minneapolis 16, Minn.

HYDRAULIC POWER EQUIPMENT

Industrial Notes

• **Norton Co.**, Worcester, Mass., will increase facilities for manufacture of silicon-carbide grain by re-equipping two of the present abrasive mills in the Worcester plant at an initial cost of $750,000. By combining the crushing and milling units now housed in these two mills, Norton's processing of silicon-carbide grain will be increased 30%. The new unit will be known as Abrasive 7.

• **Morton Machine Works** has opened a new plant at 2421 Wolcott, Ferndale, Mich.

• **National Radiator Co.**, Johnstown, Pa., has opened a new $1¼-million sheet metal fabricating plant at Duncansville, Pa. Nearly $400,000 of new machinery and equipment was installed.

• **Sterling Electric Motors, Inc.**, Los Angeles, is constructing a new $1-million plant on an 11-acre site in Van Wert, Ohio. The plant will expand Sterling's gear manufacturing facilities.

• **National Broach & Machine Co.**, Detroit, has moved into its new administration building at Shoemaker and St. Jean Avenues. Space formerly used for offices and engineering is now being used for manufacturing.

• **Charles H. Besly & Co.** is building a modern one-story plant in South Beloit, Wis., as a result of pyramiding demand for machine and cutting tools. The plant will house both divisions of the company.

• **Ohio Crankshaft Co.**, Cleveland, has under way on 71st St. a new plant to house the company's Tocco Div. The move permits the company to increase Tocco facilities and to permit expansion of crankshaft and camshaft operations into present plant areas now occupied by Tocco.

• **Western Automatic Machine Screw Co.**, Elyria, Ohio, has started construction of a $2.5 million addition to its plant here.

• **Cleveland Grinding Machine Co.**, formerly located at 6514 St. Clair Ave., Cleveland, has moved to greatly enlarged quarters at 1643 Eddy Road.

IMMEDIATE DELIVERY on RCA high-frequency ELECTRONIC GENERATORS for soldering, brazing, heat-treating

Available Today... NOW

For immediate shipment from RCA, Camden, N. J., direct to your plant. High-frequency electronic generators in sizes of 15 and 75 KW for induction heating of metals.

Big, sturdy high-power units

These generators are heavy-duty "work horses," built to stand up under long, tough production schedules. Time-tested designs. One-unit construction for compact, easy, space-saving installation. Built and backed up by RCA . . . pioneer in high-frequency heating. Nationwide service available through RCA Service Company.

Do you need applicators, too?

RCA has developed dozens of different applicators for electronic heating. Ask us about our proved designs . . . chances are there is one already worked out to fit your needs.

Generators' stock limited. Act NOW

Production of RCA electronic heating units is being stepped up to meet ever-increasing demand. But even so, the supply of completed units for immediate delivery is definitely limited. So if you need electronic heating equipment NOW . . . then NOW is the time to act.

Contact RCA at once. Get your order in fast. First come, first served. Do it NOW.

More Information? Mail Coupon TODAY

RADIO CORPORATION of AMERICA

CAMDEN, N.J.

RCA Engineering Products Dept. 139 WE
Camden, N. J.

Without obligation, please air-mail me complete information on your RCA electronic heating equipment *available for immediate delivery*, for the application stated below:

To be used for_____

KW power required_____

Name_____

Title_____

Company_____

Address_____

City_____ State_____

OLD FASHIONED METHODS

Work, but — *Slowly*

Modern Production

Calls for

EFFICIENCY with *Speed*

Maintain Production Schedules

Equip YOUR Tool Room With

OLIVER DRILL POINTERS

There are many ways to sharpen drills *but* it's generally accepted that machine grinding is the best and most accurate method. Many production slowdowns are due to excessive drill costs and imperfect holes. In most cases, they can be traced to improper grinding of the drill points. OLIVER Drill Pointers give balanced cut, with each lip doing equal work. Machine grind your drills to cut faster, last longer and produce more accurate holes.

LET US PROVE IT — Send us a few of your drills to sharpen — then check the results on your own production. No obligation.

Just a Tip — BE WISE — OLIVERIZE — **Use OLIVER Drill Pointers**

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.

No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for literature that will save you dollars in your toolroom.

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

INDUSTRIAL NOTES . . . . . cont.

• **Fanner Mfg. Co.,** Cleveland, has purchased a 30% interest in Diamond Expansion Bolt Co., Garwood, N. J.

• **General Tire & Rubber Co. of Canada, Ltd.,** has purchased Joseph Stokes Rubber Co., Ltd., of Welland, Ontario, to be operated as the Stokes Div.

• **Columbian Vise & Mfg. Co.,** Cleveland, has purchased A. E. Stevens Level Co., Newton Falls, Ohio, to be operated as the Stevens Level Div. E. A. Stevens, former president, will manage the division.

• **Lepel High Frequency Laboratories, Inc.,** has moved into a new building at 55th St. and 37th Ave., Woodside, L. I., N. Y. The new plant will enable Lepel to triple output of high frequency heating equipment.

• **Fabricant Steel Products, Inc.,** New York, has begun construction of a new million-dollar steel mill in Albany, N. Y.

• **Magna Mill Products** has completed a new $1-million plant in South Gate, Calif., equipped to handle largest types of forgings, extrusions, die castings and toolings.

• **Conoflow Corp.** has opened an auxiliary plant on 21st St. to enlarge its manufacturing facilities in the Philadelphia area.

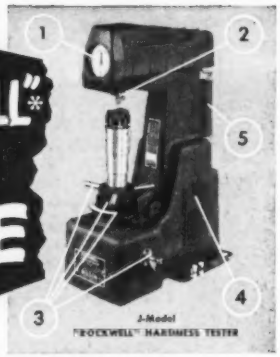
• **Reynolds Metals Co.** expects to be producing aluminum pig in January from its $80-million plant now under construction near Corpus Christi, Tex. The plant will have capacity to produce 150-million lb of aluminum a year.

• **Bodine Electric Co.** has completed a new addition to the No. 2 Chicago plant, adding 14,000 sq ft and housing 100 employees of the motor-winding department.

• **Link-Belt Co.** has opened a new factory branch store at 108 South Fourth West St., Salt Lake City.

• **National Electric Products Corp.** has purchased a million-dollar factory in Elizabeth, N. J. It has started to equip the plant with machinery for the manufacture of electrical roughing-in materials.

"ROCKWELL"* ...to be SURE



You NEED These Features

1. Totally enclosed, dirt and dust-proof "Zerominder" dial gauge. **2.** Gripsel clamp screw for quick change and proper seating of penetrator. **3.** All controls grouped conveniently under capstan hand-wheel. **4.** Enclosed, easy-to-reach variable speed dash pot. **5.** Standardized weights.

"ROCKWELL" Hardness Testers are made in two types and many styles. There is also the TUKON for micro-indentation hardness testing. Tell us your job. Let us make recommendations.

*Trade Mark Registered

ACCO

WILSON

MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

"We're always sure of Better, Faster, Lower-cost Grinding and Cutting Production . . . because we use—

ECONOMY

THE WBCo

METAL WORKING LUBRICANTS

The Economy line offers a complete range of lubricants . . . the original paste-form for mirror finishes . . . Grinding Oils for critical gear and form grinding . . . liquid type water solubles for Cutting and Grinding, and now a series of

NEW *Transparent* COOLANTS

for both Grinding and Cutting

White & Bagley experience, which dates back to the beginning of the wet grinding industry, has helped solve many of industry's metalworking problems. It's yours for the asking.

Write us for more complete information.

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.

2† PROVEN PRODUCTION PACKAGES FOR DOUBLE-DUTY IN YOUR PLANT

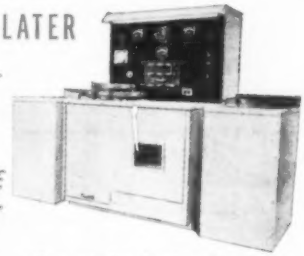
†THE CRO-HONE PRESSURE-BLAST

A COMPACT, LOW-COST WET-BLASTING UNIT . . . EASILY INSTALLED . . . EASILY OPERATED

The Cro-Hone Pressure-Blast can be operated at ***lower velocities*** for general surface finishing, pre-plating or pre-painting cleaning and the maintenance cleaning of all kinds of metal parts, tools, dies, molds, etc. At ***greatly increased*** velocities the unit is immediately adaptable to difficult descaling jobs and the close tolerance deburring of intricate recesses, spirals and long internal bores. (Uses a range of metallic or non-metallic abrasives from 45 to 5000 mesh)

†THE CRO-PLATER

A FULLY SELF-CONTAINED PRECISION HARD-CHROME PLATING UNIT



All necessary controls, rectifiers, switches, heating elements, etc. are built into the Cro-Plater. Easy to install and easy to operate, the unit can be used as an integral part of a high production plating set-up or for occasional use in the toolroom, pilot plant or laboratory. The work that can be effectively plated in the Cro-Plater is not limited in any way by available amperage. (Cro-Sol, a specially designed high-speed chrome plating solution, is offered to purchasers of the Cro-Plater.)

Together, the Cro-Hone Pressure-Blast, as the pre-plating cleaning agent, the Cro-Plater, represent a complete electroplating installation.

For the Complete Story Fill in This Coupon and Mail To —

The CRO-PLATE Company, Incorporated
HARTFORD 5, CONNECTICUT

Dept. C-3

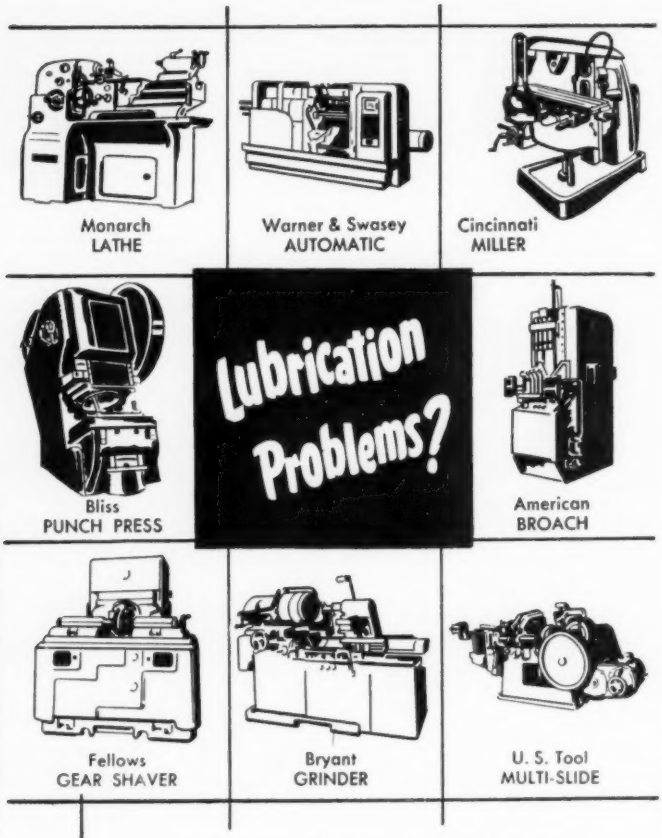
Please send me more detailed information on the Cro-Hone Pressure-Blast, and the Cro-Plater.

NAME:

TITLE:

COMPANY:

ADDRESS:



not on these machines!

...they're all BIJUR equipped

Every one of these machines is designed for continuous production. This is made possible by the built-in Bijur lubricating system. It oils the machine during operation and reduces bearing wear by controlling oil feed *at the bearings*. In both cases, it converts down-time for maintenance into more time for production. When you buy a Bijur-lubricated machine, you're assured of built-in bearing protection.

Write for Bulletin MW

BIJUR

LUBRICATING CORPORATION

Rochelle Park • New Jersey

Distributors Named

Weatherhead Co., Cleveland, has appointed the following industrial distributors; **B. H. Deacon Co., Inc.**, Philadelphia; **Knox, Inc.**, East Walpole, Mass.; **Spence Tool & Rubber Co.**, Peoria, Ill.; **P. T. Standard Parts Co.**, Pontiac, Mich.; **Diesel Injection Sales & Service**, Norfolk, Va.; **Harry Cornelius Co.**, Albuquerque, N. M.; **Hardware & Supply Co.**, Akron and Massillon, Ohio; **Hydro Pneumatics, Inc.**, New York; **Robins Rubber Div., A. K. Robins & Co.**, Baltimore.

Arcos Corp., Philadelphia, has appointed the following distributors: **Clements Welding & Machinery Co.**, St. Louis, to service St. Louis and that part of Missouri and southern Illinois east of Springfield and Sedalia; **R. & R. Welding Supply Co.**, Des Moines, to cover central Iowa, including Cedar Rapids, Mason City, Waterloo and Fort Dodge.

Cleco Div., Reed Roller Bit Co., Houston, Tex., has appointed the following distributors: **Dawson MacDonald Co., Inc.**, Boston; **Louisville Mill Supply Co.**, Louisville, Ky.; **Elect Air Tool Co.**, Burbank, Calif., and **W. E. Mushet Co.**, San Francisco.

Gorham Tool Co., Detroit, has named **Sonnet Supply Co.**, Hawthorne, Calif., as West Coast distributor.

Detroit Die Set Corp. has named **Edmund Burke Co.**, Toledo, representative for northwestern Ohio and three counties in southern Michigan.

"Back to zero — the safety man broke his arm showing the foreman how slippery his floor was!"

Conserve that Stainless!

IF you possess any stainless steel of doubtful parentage, now is the time to identify it. Most stainless alloying elements are scarce—some have reached the critical stage.

Any mixed supplies of stainless steels you have in stock have become precious, and well worth sorting out.

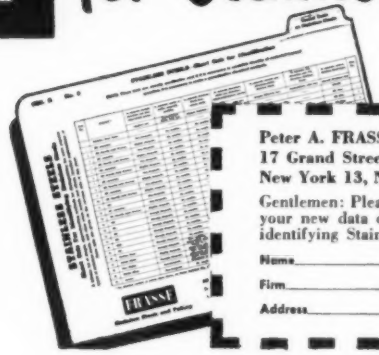
To help you, Frasse engineering service has recently revised and reissued our Data Chart, Sec. A No. 3—which describes 10 simple methods for separating stainless from carbon and alloy steels, nickel stainless from moly grades, straight chrome from chrome nickel grades, etc. A detailed explanation of each testing method is also included.

The chart is printed on durable cardboard stock, regular file card size, and can be filed, tacked on a wall, or slipped under glass for speedy reference.

A copy of this useful chart may be obtained by using the coupon below. Mail it today! *Peter A. FRASSE and Co., Inc., 17 Grand St., New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Ave., Philadelphia 29, Pa. (Baldwin 9-9900) • 50 Exchange St., Buffalo 3, N. Y. (Washington 2000) • 157 Richmond Ave., Syracuse 4, N. Y. (Syracuse 3-4123) • Jersey City • Hartford • Rochester • Baltimore*

FRASSE for Stainless Steels

- Bars
- Sheets
- Strip
- Plates
- Angles
- Wire
- Tubing
- Pipe
- Fittings



Peter A. FRASSE and Co., Inc. 1-OA
17 Grand Street
New York 13, N. Y.

Gentlemen: Please send me, without obligation, a copy of your new data chart, Sec. A No. 3—listing methods for identifying Stainless Steels.

Name_____ Title_____

Firm_____

Address_____

For quick, accurate, on-the-spot hardness testing, reading directly in the Rockwell scales.

Ames PORTABLE
HARDNESS TESTER

Flat and round bars, sheets, tubing and wire are tested on the spot without cutting off specimens. Punches, dies, cutters, saws and odd-shaped pieces are tested before and after heat treating. Used by metallurgists, inspectors and heat-treaters. Sizes for work 1" to 6" round and flat. Send for illustrated circular.

Complete with two penetrators, anvils, test blocks, case and chart.

AMES PRECISION MACHINE WORKS
Makers of Precision Bench Lathes & Milling Machines
WALTHAM 54, MASSACHUSETTS

BALANCED FOR YOU

RUTHMAN GUSHER
MACHINE TOOL COOLANT PUMPS

The rotating parts of Gusher Coolant Pumps are dynamically balanced to assure *you* efficient, trouble-free service. There is no metal-to-metal contact within the pump housing. Injury caused by vibration is minimized. *You* get a longer lasting, more efficient coolant pump for *your* metal cutting machines.

Write us today for our new catalog.
"GUSHER", The Heart of Your Coolant System

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

Geiger-Müller detector replaces photographic film in X-ray diffraction wide-range goniometer and reduces to 8 hr analysis that previously took 250 hr photographically. Device is used to determine structure, stability range, and phases of alloys; formability of sheet metal; character of plated finishes; and to study powder-mix and finished product structure in powder metallurgy. E. C. Burke, Dow Chemical Co., discusses instrument with Margaret Berry, Research & Control Instrument Div., North American Philips Co., Inc., at X-ray diffraction school held at Philips plant in Mt. Vernon, N. Y.

ROUND TABLE *Discussion*

TO EACH HIS OWN

THE IDEA which Al has in mind can be worked out to good advantage and, in a measure, has been done previously.

The present methods of production are nothing more or less than a variation of the same, only, instead of moving the product from one machine to another, the men themselves are moved and handling of materials, between operations, is avoided.

In a job shop, consider the progress of a machined piece in its progress throughout its journey.

First, it may be placed in a lathe where it may be rough cut, then finish cut; next it may be transferred to a drill, then to a planer and so

FIVE FACTS ABOUT UNIVERSAL DRILL BUSHINGS

One of the quality products that has helped to build Universal's Frankenmuth plant

1—SUPER FINISH REDUCES WEAR TO A MINIMUM

2—BLENDED RADIUS REDUCES TOOL HANG UP

3—100% CONCENTRICITY AND HARDNESS TESTS ASSURE ACCURACY

4—KNURLED HEAD PROVIDES QUICK SURE GRIP

5—COMPLETE VARIETY OF SIZES AND LENGTHS

The modern home of finer production tools

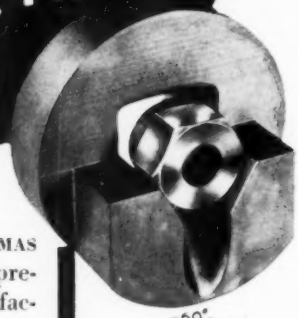
UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1, MICHIGAN

154

ELASTIC STOP NUT
CORPORATION OF AMERICA
REPORTS:

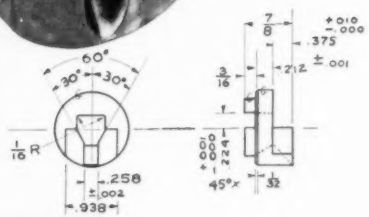
"5,250,000 NUTS AND STILL NO SIGN OF WEAR" WITH THIS SOLID ADAMAS CARBIDE WEAR PART



This is still another example of how ADAMAS solved an extremely difficult and intricate pre-forming operation that other carbide manufacturers considered impractical.

The pre-formed ADAMAS Carbide wear-part illustrated upped ESNA's tool-life by 200% to date with resulting decreased down-time and lower costs.

Your problem may be different—increasing tool life, machining a new metal, proper grade selection—and not at all like the pre-formed wear part produced by ADAMAS for ESNA. If it is, YOU CAN STILL BENEFIT by letting the ADAMAS Field Engineering staff . . . with their years of carbide experience . . . help you solve your problem.



OPERATION:
High speed drilling of a countersink in the seating surface or base of a steel nut on a Kent Countersinker.

BEFORE:
When oil-hardened steel was used as the orifice, only 1,750,000 nuts were produced before the steel tool was scrapped

AFTER:
By switching to ADAMAS carbide, 5,250,000 nuts have been produced to date—and still no sign of wear.

Send today for the NEW ADAMAS CATALOG = A851

ADAMAS CARBIDE CORPORATION
100 South 4th Street, Harrison, N. J.
PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS

Detroit Clinic: More Listings of Subcontract Opportunities

DETROIT—Prime contractor needs, exhibited at the Subcontractors Clinic held here recently, and previously reported (see p 231, AMERICAN MACHINIST, Nov. 12), are continued below:

DETROIT TRANSMISSION DIV., GENERAL MOTORS CORP., Detroit

Needs subcontractors on steel forgings, magnesium castings, screw machine parts, and bushings for Wright trainer-plane engine and Allison reduction boxes for turbo-prop power plants. Work is now in tooling stage. Also sought is machining of splines, forgings (almost all are gears), castings and internal thread grindings. Contact: H. D. Stoddard.

A. C. SPARK PLUG DIVISION, GMC, Flint, Mich.

Is interested in complete assembly subcontracting of a limited number of individual parts. There are electronic and mechanical assemblies in combination, and mechanical units only, and are for ordnance application. Work is in tooling stage. Contact: E. W. Richards, purchasing department, or Jack MacArthur, contracts department.

TIMKEN DETROIT AXLE CO., Detroit

Component parts for axles—which Timken is making for military vehicles — including axle housing, axle shafts, gears, and spur shafts, are needed. Contact: purchasing agent.

FRUEHAUF TRAILER CO., Detroit

Makes all types of trailers and subcontracts 65% of all parts. Small parts, such as stampings, castings and forgings, in quantity production are needed.

LONERGAN MANUFACTURING CO., Albion, Mich.

Wants subcontractors on sheet-metal stampings and small fabricating work. Some sub-assembly work is also available. Finished products are fuel tanks, draft registers, and draft averters. Large quantity, long run production orders are available. Contact: L. Lockwood.

DOUGLAS AND LOMASON CO., Detroit

Wants sources for screw machine parts (hand and automatic, up to 2-in. dia.) steel forgings, coil and flat springs, upset parts, wooden boxes, and certain paints, enamels, lacquers, rust preventives, etc. Contact Mr. L. F. Johnson, purchasing agent.

ALGONAC MFG. CO., Algonac, Mich.

Subcontractors for rubber molding, rubber stripping, piano hinges, and rolled-hinge sections are wanted. Parts are for Army truck cabs (2½ and 8 ton) for which the firm holds prime contracts. Work is in production. Contact: E. Y. Howell.

EX-CELL-O CORP., Detroit

Wants subcontracting assistance in building component parts for machine tools. It is primarily seeking firms to machine heavier component parts such as bases, tables, large brackets, etc. Contact: M. E. Ingalls.

KELSEY-HAYES WHEEL CO., Detroit

Will subcontract small parts for Wright aeronautical power-recovery turbine used in J-65 Turbo-jet engine. Stamping, machining, grinding, buffing, and lapping equipment is necessary to make the steel and alloy parts. Orders will be small, short run now, larger when Wright begins full scale production of the J-65 engine. Contact: W. T. Brown or E. Kaczorowski.

HARRINGTON RICHARDSON ARMS CO., Worcester, Mass.

Subcontractors with precision milling equipment are sought to produce large quantities of small rifle parts. This will be long run production. Contact: Lewis F. Baxter, purchasing agent.

GEAR GRINDING MACHINE CO., Detroit

Some steel forgings and stampings will be sub-let, both small and large items are needed. Contact: R. J. Welke, purchasing agent.

Douglas Subcontracts Run To Hundreds of Millions

LOS ANGELES—With $50 million in new civilian contracts in addition to undisclosed military contracts, Douglas Aircraft Co. has been letting subcontracts in the hundred of millions.

Indicative of their magnitude is the latest monthly reported figure of $192 million for major components placed with other manufacturers of complete aircraft. Largest subcontract announced in the last month is for C-124 Globemaster tail sections, placed with Chrysler Corp.'s Plymouth Division plant here. The amount involved is described only as "multi-million dollar." Lesser subcontracts went recently to Vendorlator Mfg. Co., Fresno, Calif., $2 million for attack-plane accessories; and to Interstate Engineering Co., El Segundo, Calif., $1 million for fuselage subassemblies.

BUICK-OLDS-PONTIAC ASSEMBLY DIV., GMC, Kansas City, Kan.

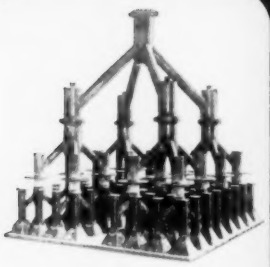
Subcontractors are sought for parts on F-84-F Republic's Thunderjet plane. The program, still in the tooling stage, will need subcontractors for small machine parts, forgings, castings, and small machine fittings. It is heavy diversified work of small quantities requiring extended facilities. Contact: E. H. Lawrence, subcontract manager or C. Brandon, director of purchases.

CONTINENTAL MOTORS CORP. Muskegon, Mich.

Has work for subcontractors on both aircraft and aviation engines. On 12- and 6-cylinder tank engines, subcontratcors are needed for screw-machine parts, manifold assemblies, air-cooled cylinder heads, aluminum castings, some stainless-steel castings. These go into Walker tank and a personnel carrier. Getty plant contact: W. Wilke. Terrace plant makes aircraft engines; dies would be different but same type of work is available. Contact: Robert Simpson.

(Continued p. 219)

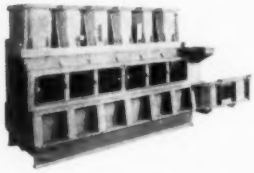
Steel-Weld FABRICATION



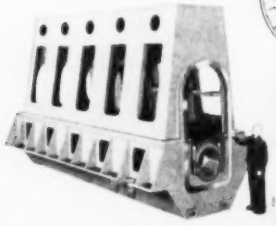
One of Several Parts of a Catalytic Cracking Plant Produced for the Petroleum Industry.

Pressure Vessels for the Chemical and Allied Industries.

Heavy Press and Machine Frames and Bases for the Machine Tool Industry.



Diesel Engine Crank Cases and Frames for the Marine and Electro-Motive Field.



Crank Cases, Frames, and other Parts for Manufacturers of Marine Steam Engines of Uniflow or Multiple Expansion Type.

Illustrated above is a group of marine steam engine frames in the machine shop of the Steel-Weld Division in the Mahon plant . . . these and many others similar in design have been Steel-Weld Fabricated and completely machined by Mahon for both diesel and steam marine engine manufacturers throughout the country. If savings in time or production costs can be effected in your manufacturing operations through Steel-Weld Fabrication of parts, assemblies or fixtures, it will pay you to investigate Mahon facilities and technical services. You will find an unique source with complete, modern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job, embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

SUBCONTRACT OPPORTUNITIES . . . . cont.

ABRAMS INSTRUMENT CORP.
Lansing, Mich.

Wants component parts made for precision timing devices. These parts include small gears, ratchet wheels, pinion assemblies, motor armatures, magnets, relay choke coils, others. Necessary equipment includes stamping, grinding, screw, gear cutting, and coil-winding machinery—all for fine, small precision work. This is small quantity, short-run work. Contact: M. R. Stuart.

CANFIELD TOOL AND DIE CO.,
Detroit

Short-run production work on tank parts is available to subcontractors. Needs heavy milling work done on suspension arms for tanks, as well as some large thread mill work on gears. Contact: William Block.

UNIVERSAL GEAR WORKS, INC.
Detroit

Wants subcontractors for gear work—hobbing, milling, turning—on aircraft and automotive replacement parts. These range from small to 72-in. gears. Most of the firm's defense contracts are now in production. Contact: A. T. Russo, purchasing agent.

STANDARD STEEL SPRING CO.,
Detroit

Wants subcontractors for fabrication of armor plate. This includes flame cutting, edge grinding, surface grinding, and drilling on plate ranging from ¼-in. to 3-in. Work is now in production. Contact: Milt Hammond, chief engineer.

MASCO SCREW PRODUCTS CO.,
Dearborn, Mich.

Wants automatic screw machine work done on small brass parts for M-48 A3 Fuze. Parts to be made include primer holder, delay holder, sitting-sleeve retainer, anvil, etc. Contact: Robert Deisley.

SARANAC MACHINE CO.,
Benton Harbor, Mich.

Small parts for 20-mm linker are wanted. These parts will involve turning, milling, grinding, or gear-cutting work, almost exclusively in steel. These are small parts and the orders will be small — 250 to 1000 pieces in most cases.

MURRAY CORP. OF AMERICA,
Detroit

Combustion chamber assemblies for Curtiss-Wright J-65 gas-turbine engines are being made by Murray. Parts such as flanges, bearing housings, and other small castings and forgings are being subcontracted. Contact: C. H. Mengle.

PACKARD MOTOR CAR CO., Detroit

Production on J-47 jet engine, developed by General Electric, should start in the next few months. The company wants to subcontract gasket, actuator-guide assemblies, ignition-tube assemblies, oil seals, de-icing assemblies, valve parts, and turbines. Contact: company itself.

VALENTINE WELDER AND MFG. CO., Detroit

Need firms to do machining operations on aluminum power take-off assembly. Contact: C. E. Valentine.

ARGUS CAMERAS, INC.,
Ann Arbor, Mich.

Subcontractors are wanted to do short-run precision work, including thread gages, built-up gages, stampings, die castings, etc. Firm holds prime contracts for telescopes and fire-control instruments. Contact: W. R. Patton, Director of Purchasing.

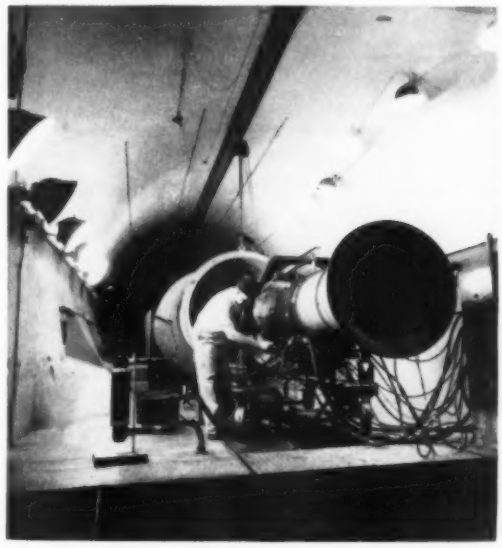
Subcontractors Cited In Record Tank Program

SAN FRANCISCO, Calif.—A pilot model of the T18E, new full-tracked armored personnel carrier, rolled off the production line of Food Machinery & Chemical Corp. San Jose, Calif., plant late in October, just nine months after the company received the Army Ordnance contract for the vehicle.

The company is considered to have established a defense production record in completing and testing a pilot model in such a short period. Following receipt of the multi-million dollar contract, complete tank production facilities had to be designed and built. This program included the erection of 300,000 sq ft of building area for tank manufacture.

Such a record was possible, company officials commented, through the complete cooperation of Army Ordnance and the numerous subcontractors participating in the program.

The company now has about 400 subcontractors in the San Francisco Bay Area, the two major subcontracts being held by Consolidated Western Steel Corp. for $15 million and Western Gear Works for an undisclosed amount. FM&C is not at present seeking new subcontractors.



Test cells at the Westinghouse turbojet plant at Kansas City, Mo. are individually controlled from a completely instrumented room. To simplify handling, the engines are tested in their final-assembly dollies. The bell-shaped duct at the front of the engine measures and funnels air to the compressor inlet

"RUDOLPH SAYS HE KNOWS THE TAPS WOULD LAST LONGER IF HE HAD THE RIGHT CUTTING FLUID ON THE MACHINE!"

USE OF the *right* cutting fluid for the job *makes taps last longer,* conserves critical tool steel, minimizes down-time, increases output. A typical example:

A large instrument manufacturer changed to Stuart's THREDKUT for tapping Allegheny metal.

	Before Using ThredKut	After Using ThredKut
Tap Life	2 hours	8 hours
Production	180 holes per hour	400 holes per hour

You just cannot ignore the fact that the cutting fluid used is a major factor in any machining operation. A Stuart Representative is prepared to show you how Stuart combines theory and practice to give you better operating performance. Ask to have him call.

Are you receiving Stuart's Shop Notebook regularly? Write, wire or phone.

STUART SERVICE
Goes with every Barrel

CONSERVE TOOLS
Use the Right Cutting Fluid

D.A. Stuart Oil CO.
2729 S. Troy St., Chicago 23, Illinois

Marmon-Herrington to Build $10 Million of AF Crash Trucks

INDIANAPOLIS, Ind. — Marmon-Herrington Co., Inc., has received a contract from the Air Force for the manufacture of several hundred crash and fire-fighting trucks. Initial dollar value of the contract will total more than $10 million.

Designated Model 0-10, the new truck is a six-wheel drive, all-weather vehicle designed to reach crash scenes in fastest possible time, regardless of weather or terrain.

Administration of this contract is under jurisdiction of Indianapolis Regional Office, Mid-Central Air Procurement District and properly qualified subcontractors will be cleared through that office.

Navy Lets Contracts For 30 Minesweepers

WASHINGTON — Seven private shipyards have been awarded contracts by the Navy for construction of thirty mine sweepers. Earlier this year the Navy contracted for thirty-nine of the 165-ft craft, all but two of the awards going to private yards.

Breakdown of individual contract values were not disclosed, but total value will run close to $59 million.

The companies and the number of units they will build are: Luders Marine Construction Co., Stamford, Conn., four; Higgins, Inc., New Orleans, five; Burger Boat Co., Manitowoc, Wis., five; Peterson Builders, Inc., Sturgeon Bay, Wis., three; Bellingham (Wash.) Shipyards Co., five; Astoria (Ore.), Marine Construction Co., three; and Wilmington (Calif.) Boat Works, Inc., five.

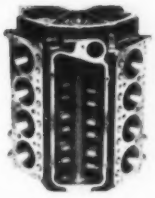
Chrysler to Build H-S Propellers for Navy

DETROIT—Chrysler Corp. has received a substantial contract from the U. S. Navy to prepare for production of Hamilton Standard propellers at the Dodge plant at San Leandro, Calif.

The Dodge plant will be converted to a "dual-purpose plant" with the addition of 750,000 sq ft for the propeller project. Civilian production will not be affected.

An engineering assistance and license agreement has been negotiated with Hamilton Standard Div., United Aircraft Corp., for Chrysler to build the 16½-ft propellers.

Performs 180 operations in 43.5 seconds. Drills, spot-drills, rough-bores, c'bores, c'sinks, and reams. Includes 360 rotating fixture for removal of chips at station No. 11, and automatic gauge of drilled holes at station No. 17.



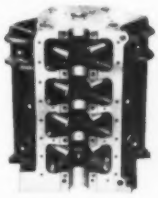
Capacity...

80

CYLINDER BLOCKS AN HOUR

379

OPERATIONS

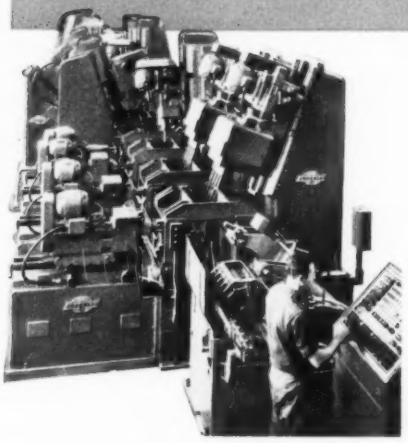


GREENLEE

TRANSFER MACHINES

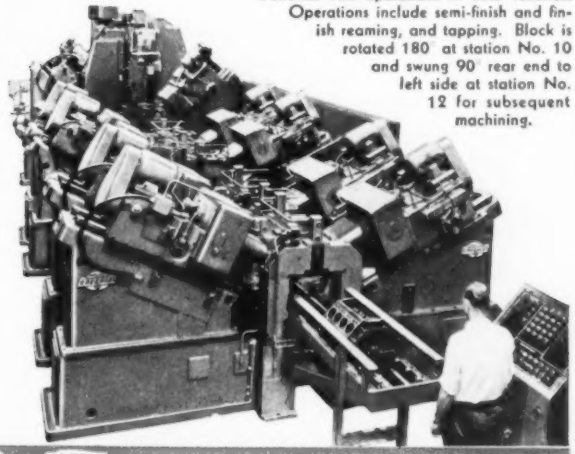
When you see one of these big Greenlee transfer machines working — turning out a tremendous quantity of work so smoothly and easily — you realize the qualities that make them great. Here is power, precision, durability, and a vast multiplicity of operations in a compact, integrated unit. Here is modern mass-production in its most successful form.

Greenlee's pioneering experience, added to years of accumulated skill, has created an organization that can successfully and repeatedly produce these outstanding machines.



Performs 76 operations in 43.8 seconds. Drills, c'sinks, c'bores, and trepans. Tilts part at station No. 1 to 180 for subsequent machining. Automatically gauges and cleans drilled holes at station No. 20.

Performs 123 operations in 35.5 seconds. Operations include semi-finish and finish reaming, and tapping. Block is rotated 180 at station No. 10 and swung 90 rear end to left side at station No. 12 for subsequent machining.

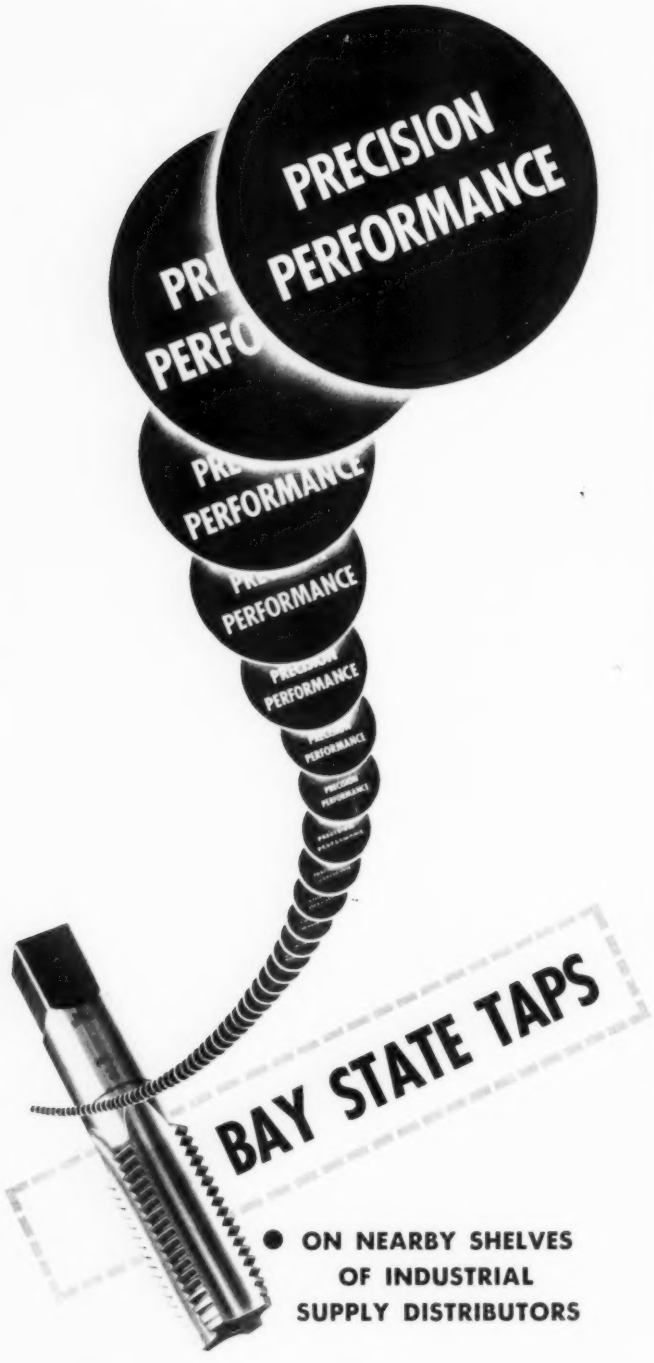


PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO. 1731 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES


PRECISION PERFORMANCE
BAY STATE TAPS
ON NEARBY SHELVES OF INDUSTRIAL SUPPLY DISTRIBUTORS
BAY STATE TAP & DIE CO., Mansfield, Mass.

LATEST DEFENSE

ARMY ORDNANCE AWARDS

Rock Island Arsenal, Ill.

Fidelity Machine Co., Philadelphia—visual-inspection machines, horizontal-trim machines, and first visual-inspection machines. No figure available, five contracts.

Jennings Machine Corp., Philadelphia—first visual-inspection machines; second visual-inspection machines, single-spindle horizontal machines, second trim; first-trim horizontal machines, second trim horizontal machines. No figure available, five contracts.

R. K. LeBlond Machine Tool Co., Cincinnati—broaching machines, 69-in. bed, exceeds $250,000. Long-bore machines, with 68-in. bed, exceeds $250,000.

Springfield Ordnance District, Springfield, Mass.

Republic Steel Corp., Cleveland — barrel blanks, $103,683.

Cincinnati Milling & Grinding Machines, Inc., Cincinnati—machines, $211,954, $31,793 (2 contracts).

SIGNAL CORPS AWARDS

Philadelphia Procurement Agency

Collins Radio Corp., Cedar Rapids, Ia.—transmitting set, exceeds $250,000.

Connecticut Telephone & Electric Corp., Meriden, Conn.—hand sets, exceeds $250,000.

Federal Telephone and Radio Corp., Clifton, N. J.—receiver-transmitter, exceeds $250,000 on each of six contracts. Radio receiver, exceeds $250,000 on each of two contracts. Control group, exceeds $250,000 on each of three contracts. Amplifiers, exceeds $250,000.

Gray Mfg. Co., Hartford, Conn.—amplifiers, exceeds $250,000. Control units, exceeds $250,000.

Kellogg Switchboard & Supply Co., Chicago—jack assembly, exceeds $250,000.

Measurements Corp., Boonton, N. J.—signal generators, exceeds $250,000.

Polaroid Corp., Cambridge, Mass.—production equipment for radar-detecting elements, $195,000.

Epsey Mfg. Co., New York—radio terminal set, $116,815.

Universal Microphone Co. and **Skycraft Tool Engineering Co.**, joint contract, Culver City, Calif.—microphones, $229,947.

Moore Drydock to Build New Landing-Ship Dock

WASHINGTON — Moore Drydock Co., San Francisco, has been awarded a Navy contract to build the first of a new and larger-type landing-ship dock.

Navy Bureau of Ships said contracts for three more seagoing docks will be awarded on a competitive basis. Moore will perform design work and act as central procuring agency.

The new LSD's will be 510-ft long, 84-ft wide, and displace 6500 ton, all somewhat larger than World War II models. Contract costs will not be available until completion of design.

CONTRACTS

NAVY AWARDS

Bureau of Ordnance, Washington 25, D.C.

Daystrom, Inc., Elizabeth, N. J.—reconditioning and installation of plant equipment, exceeds $250,000.

American Central Div., AVCO Mfg. Corp., Connersville, Ind.—production facilities for torpedoes, exceeds $250,000.

Nesco, Inc., Granite City, Ill.—aircraft parachute flares, exceeds $250,000.

Universal Molded Products Corp., Bristol, Va.—machine tools and production equipment, $112,253.

Navy Purchasing Office, Washington 25, D.C.

Service Caster & Truck Corp., Albion, Mich.—fork-lift trucks, $100,336.

Automatic Transportation Co., Div. of Yale & Towne Mfg. Co., Chicago—fork-electric trucks, $161,925.

Ross Carrier Co., Benton Harbor, Mich.—fork lift trucks, $215,750.

Construction Battalion Center, Port Hueneme, Calif.

Worthington Pump & Machinery Corp., Los Angeles—repair parts, $101,026.

Pettibone Mulliken Corp., Chicago—dragline buckets, $102,770.

Amana Refrigeration, Inc., Amana, Iowa—refrigeration units, $125,065.

Blaw-Knox Div., Blaw-Knox Co., Pittsburgh—concrete spreader, $135,465, $187,187 (2 contracts).

Koehring Co., Milwaukee—crane spare parts, $135,828.

Armco Drainage & Metal Products, Inc., Calco Div., Los Angeles—ammunition-storage magazines, $228,097.

Barber Greene Co., Aurora, Ill.—spare parts, $137,307.

George Haiss Mfg. Co., Inc., Div. of Pettibone-Mulliken Corp., Chicago—clamshell buckets, $154,715. Equipment, $155,112.

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Lima, Ohio—crane equipment, $161,992.

Steelcraft Mfg. Co., Rossmoyne, Ohio—crane equipment, $164,329.

Freuhauf Trailer Co., Detroit—truck tank, $176,310.

Rome Grader Corp., Rome, N. Y.—road-grader equipment, $235,452.

Bishop Mfg. Co., Inc., Carlisle, Iowa—steel tanks, exceeds $250,000.

Thew Shovel Co., Lorain, Ohio—crane equipment, exceeds $250,000.

Rome Grader Corp., Rome, N. Y.—road graders, exceeds $250,000.

Western Iron and Foundry Co., Wichita, Kan.—crane attachments, $119,018.

Trackson Co., Milwaukee, Wis.—shovels, hoist-loaders, and crane spare parts, $227,740.

Baldwin-Lima Hamilton Corp., Lima-Hamilton Div., Lima, Ohio—spare parts, exceeds $250,000.

Ships Parts Control Center, Mechanicsburg, Pa.

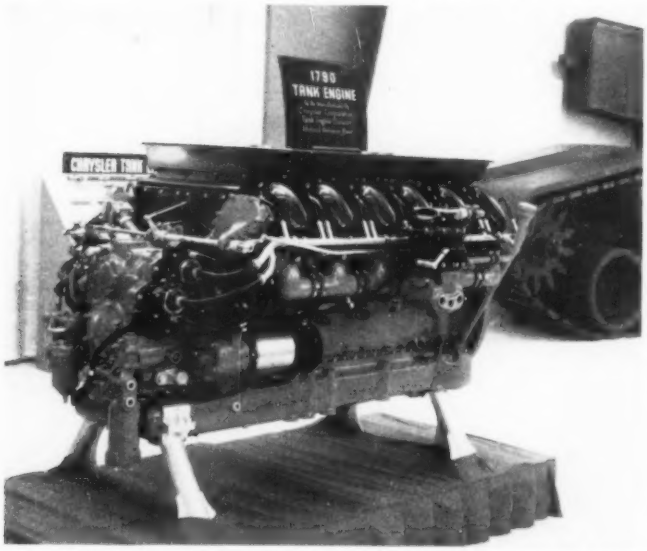
Elliott Co., Crocker-Wheeler Div., Philadelphia—repair parts for electric motors and generators, $103,437.

Skinner Engine Co., Erie, Pa.—engine repair parts, $116,809.

Pitometer Log Corp., New York—repair parts, $145,450.

Foster Engineering Co., Union, N. J.—valves and repair parts, $105,377.

Woodward Governor Co., Rockford, Ill.—repair parts, diesel engines, $131,470.



V-12 air-cooled tank engine, part of Chrysler Corp's. defense assignments which were exhibited recently in Detroit. The engine is to be produced by Chrysler Div. at its plant in New Orleans. In the background is a symbolic representation of the heavy tank to be built at a new plant at Newark, Del.

Firestone Making Rocket Engines

AKRON, Ohio — Firestone Tire & Rubber Co., working under a contract from the Navy Bureau of Ordnance, is producing rocket engines for aircraft rockets at its plant here.

The aircraft rockets, standardized for use by Navy or Air Force combat planes, are the same model used so successfully in Korea. They give fighter planes additional firepower equivalent to a salvo from a battery of five-in. naval guns.

Dravo Corp., Philadelphia—repair parts for turbines, gears, and pumps, exceeds $250,000.

United Motor Service Div., GMC, Detroit—electrical equipment, repair parts, $144,302.

Auto Engine Works, Inc., St. Paul, Minn.—repair parts, diesel engines, $128,424.

Buffalo Pumps, Inc., Buffalo, N. Y.—repair parts for pumps, $179,517.

Detroit Diesel Engine Div., GMC, Detroit—diesel-engine repair parts, $190,388.

Aviation Supply Office, Philadelphia 11, Pa.

United Aircraft Corp., Chance Vought Aircraft Div., Dallas, Tex.—maintenance parts F4U-4B aircraft, exceeds $250,000.

Airesearch Mfg. Co., Garrett Corp., Los Angeles—services and materials, $100,000.

Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y.—damper assembly, exceeds $250,000.

AIR FORCE AWARDS

Air Materiel Command, Wright-Patterson Base, Dayton

Howard Foundry Co., Chicago—magnesium casting facilities, $200,000.

Delco Products Div., GMC, Dayton—production facilities, A-1A computers, exceeds $250,000.

Loewy Construction Co. Inc., New York—forging press, supplies and services, exceeds $250,000.

American Brass Co., Waterbury, Conn.—miscellaneous parts, $100,000.

Foote Bros. Gear & Machine Corp., Chicago—B-47 airplane facilities, gear mechanism, exceeds $250,000.

Chandler Evans Div., Niles-Bement & Pond Co., West Hartford, Conn.—machinery and equipment, exceeds $250,000.

Wellman Bronze and Aluminum, Cleveland—magnesium castings, exceeds $250,000

Chicago Metal Hose Corp., Maywood, Ill.—B-47 ducting assemblies, $118,500

International Harvester Works, Louisville, Ky.—production facilities, T-29 components, exceeds $250,000.

Cessna Aircraft Co., Wichita, Kan.—production facilities, aircraft, exceeds $250,000.

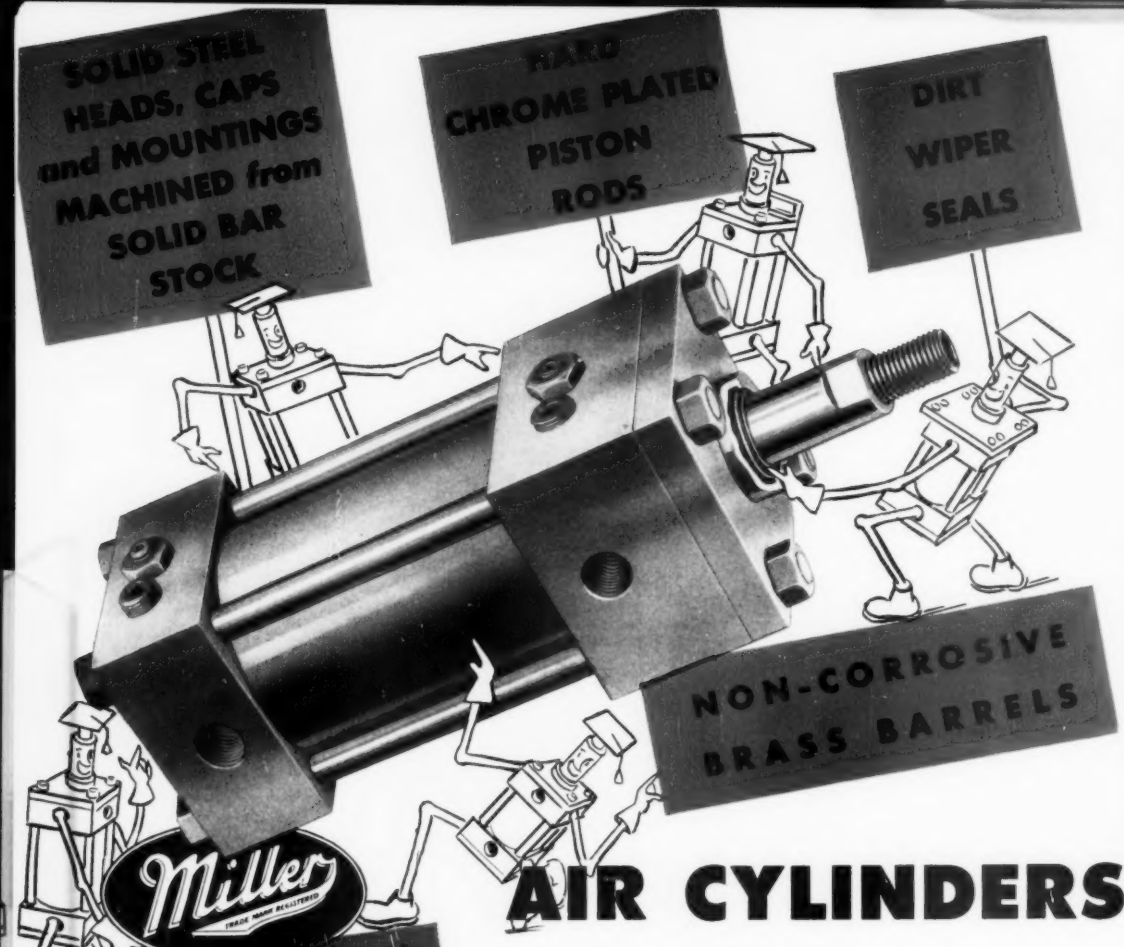
General Electric Co., Lockland, Ohio—machinery and equipment, exceeds $250,000.

Breeze Corporations, Inc., Newark, N. J.—production facilities, electrical connections, exceeds $250,000.

General Electric Co., Syracuse, N. Y.—radar training sets, major components, exceeds $250,000.

Lockheed Aircraft Service, International, Inc., Long Island, N. Y.—repair and maintenance, exceeds $250,000.

Republic Aviation Corp., Farmingdale, L. I., N. Y.—special tools and ground-handling equipment, exceeds $250,000.


SOLID STEEL HEADS, CAPS and MOUNTINGS MACHINED from SOLID BAR STOCK
HARD CHROME PLATED PISTON RODS
DIRT WIPER SEALS
NON-CORROSIVE BRASS BARRELS

AIR CYLINDERS

Meet J. I. C. PNEUMATIC STANDARDS . . .

(Write for FREE copy of these "Standards")

The four features illustrated above serve to show how Miller Air Cylinders *for years* have been meeting—*even exceeding*—the high quality set by the recently adopted J.I.C. Pneumatic Standards for Industrial Equipment. See for yourself! . . . write for our free bulletin A-105 and receive also your own *free* personal unabridged copy of these "Standards" with standard symbols, sample circuit, interesting point-by-point comparison—all neatly compiled into a handy booklet that fits your reference file and folds to fit your pocket.

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION. LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI, HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

2004 N. HAWTHORNE, MELROSE PARK, ILL.

AIR AND HYDRAULIC CYLINDERS — ACCUMULATORS — COUNTERBALANCE CYLINDERS — BOOSTERS — AIR HOISTS

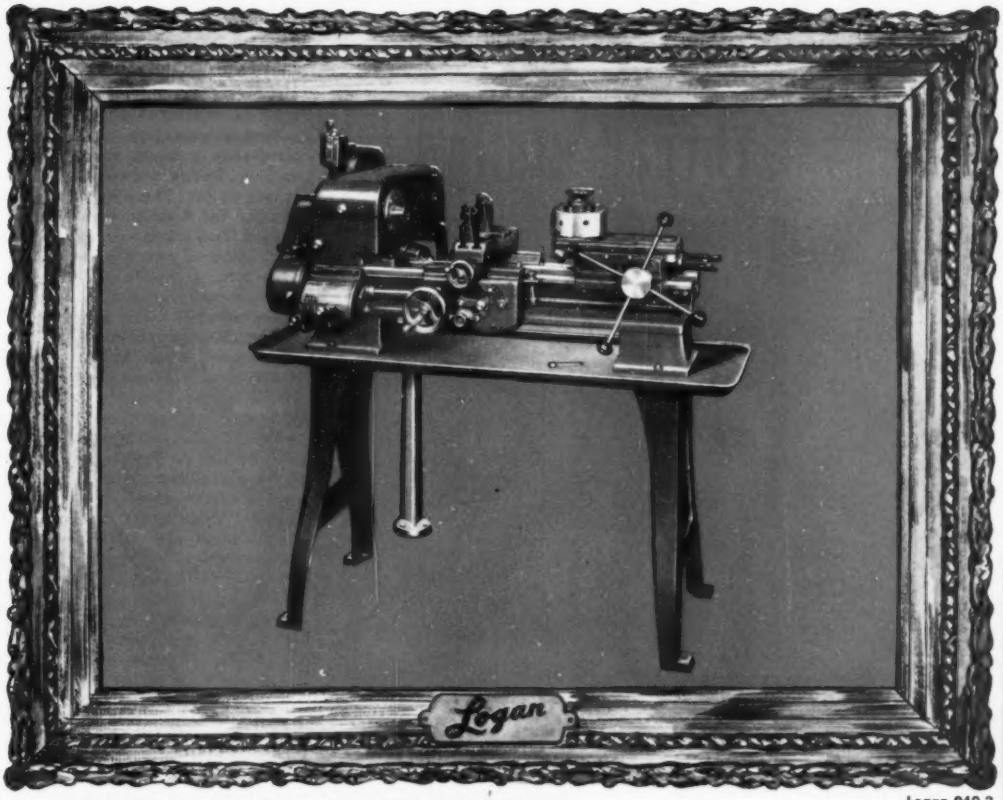
CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
HARTFORD — NEW YORK CITY — DAYTON — ST. PAUL — FORT WAYNE — INDIANAPOLIS
MILWAUKEE — NASHVILLE — SEATTLE — LOS ANGELES — SAN FRANCISCO — BALTIMORE
ST. LOUIS and OTHER AREAS.

Miller

Benefits to You

No Broken Castings
No Scratch-Damage to Piston Rods, Bushings and Seals
NO COSTLY "DOWNTIME"
NO REPAIRS
NO MAINTENANCE
NO POWER WASTAGE

Sales and Service from coast to coast



Logan 940-2
Quick Change Gear
Turret Lathe
11" Swing, 1" Collet Capacity,
1⅜" Spindle Hole

PRODUCTION MASTERPIECE

THE *Logan* LATHE

Puts Profit In Production

Industry's respect for the Logan Lathe as a metal-working production tool is not an overnight development. Through the years, Logan Lathes have put many a production line on a profitable basis. Today, with its 11" swing, 1" collet capacity, and 1⅜" spindle hole, the production efficiency of the Logan Lathe is being used on a wider scale than ever before.

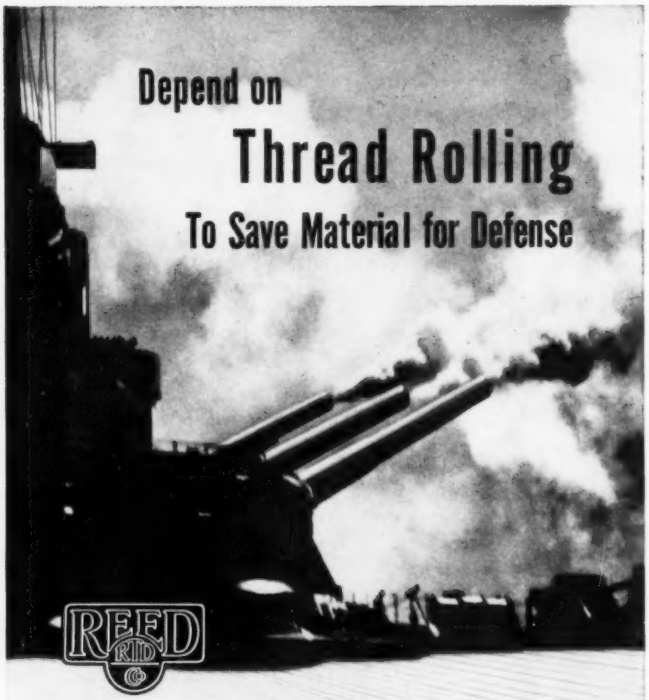
The Logan is easily set up for every type of lathe turning operation. The Logan ball bearing mounted spindle has the sustained accuracy at high speeds to hold precision tolerances. The lasting accuracy and rugged durability of Logan construction keep production going at top efficiency, at minimum cost per finished part. For the production line, tool room or machine shop, no other lathe of comparable specifications can match the Logan in economy.

WRITE FOR THIS LOGAN LATHE AND SHAPER CATALOG

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

4901 West Lawrence Avenue, Chicago 30, Illinois



Cylindrical Die Thread Rollers

For Precision Threading Knurling — Forming Burnishing — Serrating

Thread rolling saves expensive material at a time when it is not only at a premium but difficult to obtain. This is particularly true on headed parts, metal stampings and long or short bars partly threaded or threaded their entire length.

As a pioneer in thread rolling, Reed has worked closely with the Air Corps, Army and Navy in engineering the various applications of thread and form rolling. Reed equipment has provided an economical method of producing precision parts at lower manufacturing, assembly and inspection costs.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

Manufacturers of

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS

Worcester, Massachusetts, U.S.A.

AM-021

it goes. It is stopped at different stations where work is to be done on it until the piece is finished and is ready for shipment or is to be assembled with other pieces to make a complete unit.

Several years ago, in a medium sized shop a bright apprentice had an idea. To-day, are such young men in our shops? The idea was carried out for the 8,000 pieces to be machined. Two lathes were set opposite each other on two sides of an aisle. Two men, a machinist and an apprentice, were assigned to the job.

On lathe No. 1, the apprentice did the rough turning of each piece, then he stepped across the aisle where a new piece had been placed in lathe No. 2 by the machinist.

The apprentice then began the roughing part of the work on lathe No. 2 while the leader took over on lathe No. 1 and completed the finishing operations which largely consisted of grinding the outer diameter to the exact size; at the same time, the apprentice was roughing another piece on the second lathe.

When the leader had finished the piece on the first lathe, he removed it, placed a fresh piece in it and the apprentice returned and began the roughing work on the new piece.

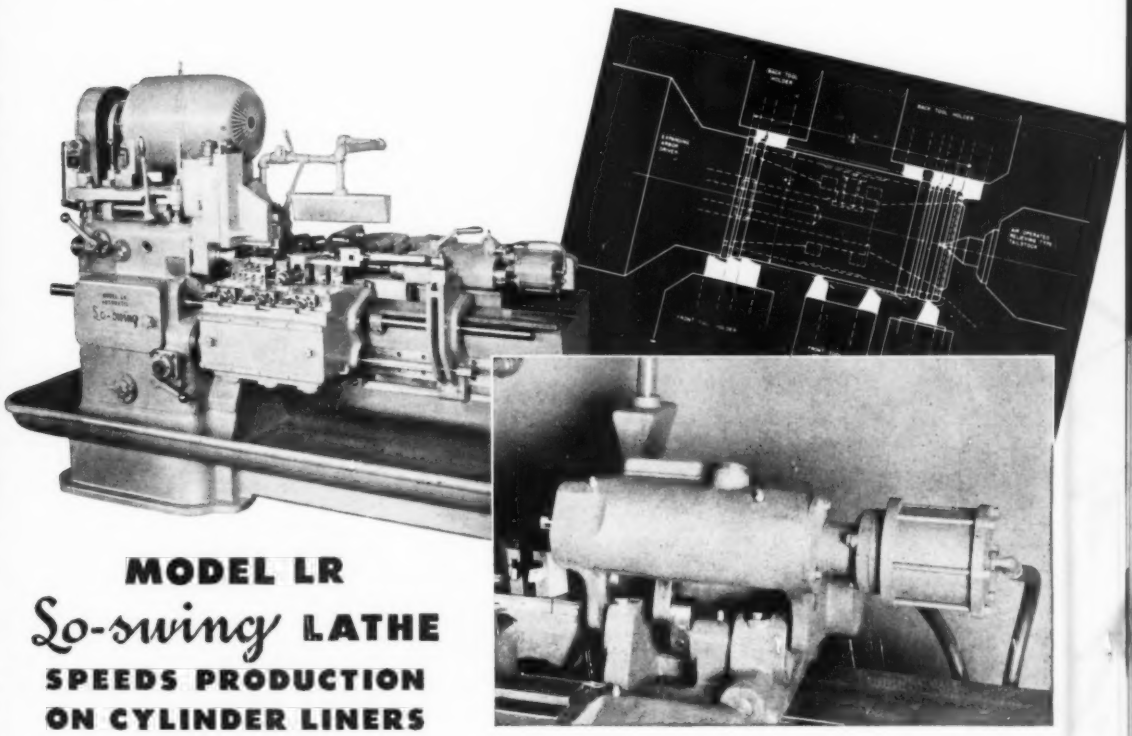
By this method, much handling of the product was avoided and time was saved, for, by having the leader remove the finished pieces and place the new ones in the lathes, the apprentice was relieved of this part of the work and few errors were made.

Another advantage of this method was, that having the leader set the new pieces and remove the finished ones, this time, along with the grind-

"I'm not as surprised at the $500 check as I'm at getting full credit for an idea—around here."

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL LR
Lo-swing LATHE
SPEEDS PRODUCTION ON CYLINDER LINERS

Problem: To automatically turn outside diameters, face and groove cast iron Cylinder Liners of various types with Carbide Tools.

Solution: Model LR Lo-swing Automatic Lathe was selected for this job because of its demonstrated fine performance with carbide tools, and its ease of setting-up due to its Simplified Change-Over Mechanism. A Relieving Tailstock which minimizes tailstock spindle overhang, and which facilitates loading and unloading, was incorporated.

The cast iron cylinder liners are delivered to the Lathe with the bore machined to size and the large end faced. They are held and driven with an air-operated, expanding collet arbor which extends the full length of the piece. This large area driving surface permits the high cutting speeds and coarse carriage feeds required for fast production. Loading of the parts is simplified with the Relieving Type Tailstock, shown in the close-up illustration. Since the driving arbor is bolted to the spindle nose, the operator is relieved of handling heavy stub arbors generally used when work is held between centers. The outside diameters and the short taper on the tailstock end of the liners are turned with six tools mounted on the front slides; all facing and grooving operations are accomplished with tools mounted on the rear slide. The entire operation is automatic—the operator simply loads and unloads the parts and pushes the starting button.

Seneca Falls engineers are at your disposal to assist you with your turning problems.

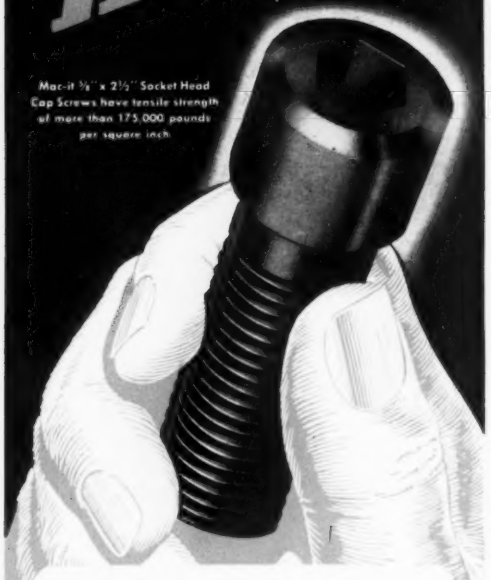
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

IT'S A

Mac-it®

PRONOUNCED "MACK-IT"



Built for Strength!

For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

Mac-it's 38 years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

Other Mac-it products include:

Hollow Lock Screws	Socket Screw Keys
Hollow Set Screws	Square Head Set Screws
Stripper Bolts	Hexagon Head Cap Screws
Hollow Pipe Plugs	. . . and many others

Marketed Nationally Since 1913 by

STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

save handling—speed production

with

ELECTROLIFT

WORM DRIVE HOIST

Here's a one-man hoist that moves loads up to 6 tons smoothly, quietly, quickly, safely and economically. With the savings in handling and speed-up of production, ElectroLift easily pays for itself.

There's a model for each of your needs. Just call your ElectroLift representative listed in the classified telephone directory. Or write to:

WORM DRIVE ELECTROLIFT HOISTS

ELECTROLIFT, INC., 30 Church Street, New York 7, N. Y.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

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JAMAICA, NEW YORK

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STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

Straight Side Press

ZEH & HAHNEMANN CO.

NEWARK N. J.

180 Vanderpool Street

ing, just balanced the time required for roughing. After the lathe work was finished, the pieces were advanced to such other machines as was necessary to complete the work on them.

When taking everything into consideration, it is easy to see that it is more plausible to move the men than it is to move the product for it requires more time to move the latter from machine to machine.

By moving the men, time is saved and time costs money.

Yes, Al has the right idea.

F. H. Stebbins
Worcester, N. Y.

•

TEA FOR TWO

THE IDEA of serving refreshments as a pickup I think is a good thing. No matter how much an employer looks out for the interest of his workers, there will always be one or two who are extremely skeptical as to his motives. This is a fast age we are living in and it behooves the boss to do what he can to make the going a little easier for his men.

A short period at mid-morning and another in the afternoon in which the worker can relax, and also satisfy the cravings of the inner man, will enable him to do more effective work notwithstanding the obvious loss of time caused as a consequence. This loss is more than compensated by the new life given to the worker. Of a certainty there will be one or two people, there always are and I am afraid there always will be, who will take advantage of the situation and stall around unnecessarily.

For the purpose of calling that type of worker's bluff I'd recommend the installation of a hell of a big gong—three feet in diameter—to be used to give them a gentle hint that the party was over and that they should get back to work.

John Homewood
Ontario, Calif.

•

BARGAIN SHOPPER

IT TAKES TWO to make a bargain, and if an applicant for a job considers it a bargain to obtain employment in a particular company it certainly shouldn't be classed as "labor-stealing" for that company to hire him. Competition for labor in busy times is a serious problem for any employer. It would be a bad bargain where nobody gains if every worker who came looking for a job would be turned away because he

All Lovejoy Blades for Type "A" Milling Cutters are interchangeable from 4½" to 24" in diameter
. . . and this applies to every "A" cutter ever made!
Lovejoy Type "A" face milling cutter blades offer unsurpassed economy — 1) they are interchangeable throughout the complete range of housing sizes, 2) H.S.S., carbide and cast alloy blades are interchangeable in every housing, 3) every blade will fit every Type "A", even if you have housings 30 years old, 4) only a minimum of stock must be removed when sharpening, 5) a large percentage of every blade is usable; 6) there is no need to carry a large inventory, as Lovejoy can supply blades promptly from stock. For superior performance, plus maximum economy, use Lovejoy Type "A" for every face milling job.
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how good is your control?

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. . . presents step-by-step procedure used profitably in hundreds of plants . . . how it works to—

. . . Record each employee's tools or gages, preventing hoarding, theft and loss;

. . . Recover idle tools;

. . . Cut crib inventories;

. . . Reduce tool breakage;

. . . Locate each tool, loaned or in crib;

. . . Eliminate delays, saving man and machine time;

. . . Stop arguments and otherwise speed service;

. . . With no increase in crib personnel—

Fully described in this bulletin

Complete control of your tools and gages will save dollars and head-aches in the months ahead. Mail coupon for your copy today.

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Send me the facts on McCaskey Tool Crib Control.

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Company

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was still on the employment rolls of another company. However, labor-stealing in the sense of cutting in on someone else's employees, if done knowingly, is not an admirable practice for any firm to indulge in. But it must be borne in mind that in most cases, where an applicant applies for a job, the hiring company is under no obligation to contact the man's former employer to determine if he is still employed there.

Under our free enterprise system, management is free to hire whom it pleases. It must also grant the worker freedom to choose his employer without jeopardizing his livelihood. However, the worker should be fair and honest enough to advise his employer of his intention to leave when a better job is available. Shopping around for a new job is one of a worker's rights. Firing a man an employer thinks is not up to scratch is also a right, but not so many employers are doing it. The reason is that workers have plenty of chances to land jobs as the new production effort begins to hit its stride, and firms are fearful they will not be able to replace workmen who quit.

Of course workers are interested in hours of work, paid vacations, and pensions, but the most important item to the average worker is salary. The iron law of wages governs most of the bargain shopping of workers for new jobs. To most workers the only real reason for working is to earn money with which to live. Platitudes about the rewards of virtue and the sense of well-being in accomplishing one's daily work are well enough if used as a leavening to the loaf; but they are a poor substitute for the main part—the dough. The worker can be discouraged from bargain shopping

"Now, eat heartily, boss — it all goes on my expense account anyhow!"

1 MICRO-INCH FINISH
is diamond lapped and imparts a bright, lustrous surface to parts drawn.
750,000 p.s.i. COMPRESSIVE STRENGTH
deep draws the toughest alloys with ease—without pickup, scoring or scratching.
95,000,000 p.s.i. MODULUS OF ELASTICITY
(3 times steel) holds size and tolerance to .0001"—cuts rejects and scrap.
SPECIAL MOUNTING PROCESS
is accurately calculated to withstand drawing pressures—and increases both the transverse and longitudinal strength of the nib.
79 ROCKWELL "C" HARDNESS
(hardest steel—68 "C") of talide nib assures continuous 24-hour production without downtime or maintenance costs.
up to 24" in diameter
ALLOY STEEL CASE
of maximum hardness, strength and toughness gives adequate support and backing to the carbide nib.

an easy way to *Triple Production* on a machine or press

• On the same presses and machines now in your production line, Talide Carbide Dies can make a big $ and ¢ difference. *Here's why.* Each Talide Die will outwear a steel die by at least 20 times and, in most applications, will last 50 times longer. Think of the cost advantages of those long runs and all the advantages of infrequent "down time" for re-dressing. Do as others do, *triple* your production with Talide Metal.

Made of the hardest metal known, each Talide Die has the same great strength, phenomenal resistance to wear and consistent uniformity. Talide Carbide never varies in quality.

Talide Carbide Dies are available for blanking, drawing, swaging, extruding, spinning or curling. For other operations, buy Talide bar stock, blades, cutting tools, drill jig bushings, work rolls or diamond products.

Try Talide Metal and triple your production with present equipment. Write us or nearest sales office.

Send for Catalog 50-G.

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HOT PRESSED CARBIDES

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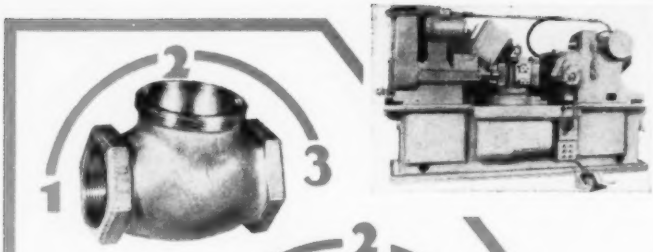
YOUNGSTOWN 7, OHIO *Pioneers in Tungsten Carbide Metallurgy*

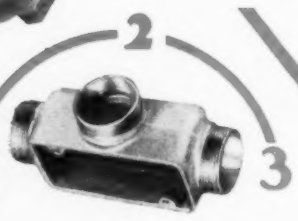
CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS



GOSS & DeLEEUW

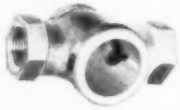
AUTOMATIC CHUCKING MACHINES

perform one to three operations in sequence or simultaneously . . .



TO CUT PRODUCTION COSTS...

More completely finished parts at the end of the day with no partly finished pieces lying around is the regular accomplishment of Goss & De Leeuw "1-2-3" chuckers. It means complete finishing on one, two or three ends simultaneously or in sequence without tool resetting, rechucking or parts handling. Machining operations may include boring, facing, turning and threading.



Change over from job to job is simple. Cost-cutting is assured on long or short runs. Goss and DeLeeuw Chucking Machines are the only standard machines of their type which operate the "1-2-3" way to reduce costs per piece and step up the number of pieces per hour.

•

Investigate the opportunities offered by these machines on your production by sending samples of your work for time and cost estimates—Ask for illustrated descriptive literature.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

GOSS *and* DeLEEUW
MACHINE COMPANY, *KENSINGTON*, CONN., *U.S.A*

through being given periodic increases by his employer. Much good can be accomplished to retain good employees by granting small, frequent raises, accompanied by fair praise for consistently good work or for some outstanding job.

However, when the "bargain shopper" comes knocking at the employment gate, the employer should be careful in his consideration of this type of worker for his plant. Too many "bargain shoppers" are incompetents, malcontents and drifters. The trained foreman through his knowledge of proper hiring procedure, including adequate interviews and tests can determine if the applicant is suitable.

Harry Kaufman
Philadelphia, Pa.

•

TRUTH PARTY

MY EXPERIENCE leads me to believe that a person when applying for a job is apt to be somewhat disturbed and uneasy and if helped in steadying his nerves by a short talk on general topics, his fears will be allayed.

This leads me to believe that one man only, the personnel man, can best conduct this preliminary talk. It should be followed by a trip to the shop, an introduction to the foreman, the immediate surroundings looked over, and the work to be done explained.

There is no doubt but that three men sitting in would bring into the interview some points of value, but it is my belief they would have an adverse effect on the applicant in keeping him from expressing himself freely. He would feel that they were probably looking for evidence against him rather than looking for desirable points in his makeup.

John Mark May
Watervliet, N. Y.

•

A FOREMAN who wants someone else to run his department and to do his work for him never should be allowed to remain a foreman. He should be replaced quickly by management with a man who is capable of making his own decisions and one who does not have to rely upon the thoughts of the other workers whom he is supposed to supervise.

The question of an unfair load upon the men involved in such a committee is not important. The unionized labor today would welcome the chance to run the selection of personnel and the advancement of its members within a company. This is the opening which would be presented if Al carried out his idea. Beyond that Al would lose all his

ACCURACY

you can depend upon

Philadelphia Gears are cut and tested on modern machines. Our skilled craftsmen employ latest gear making methods to insure accuracy in every phase of production.

Add to this our long experience in making gears of all types, sizes and materials . . . almost 60 years . . . and it is obvious why Philadelphia is gear headquarters for thousands of industrial plants.

For one gear or a hundred . . . for satisfaction . . . order Philadelphia gears.

Philadelphia Hypoid, Zeral, and Spiral Bevel Gears are available in sizes ranging up to 48 inch diameters. Write on your Business Letterhead for our latest Gear Catalog.

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Industrial Gears and Speed Reducers
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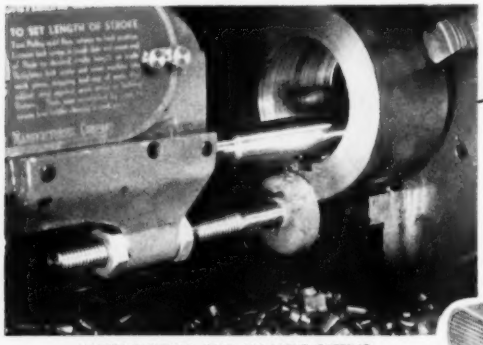
Step up PRODUCTION

ON YOUR

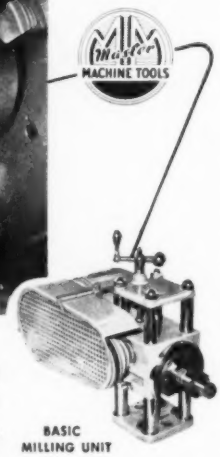
LATHE—TURRET—OR MILLING MACHINE

with **Master Machine Tool Attachments**

(MASTER LATHE CONVERTER)

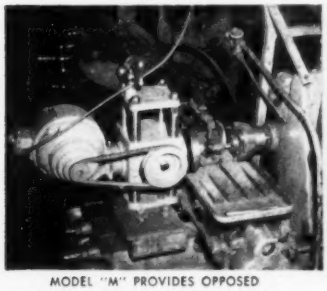


MASTER SLOTTING HEAD ON LATHE CUTTING ½" KEYWAY IN STEEL SLEEVE IN 4½ MINUTES



BASIC MILLING UNIT

The Master attachments can be used profitably on many production operations. The basic milling unit with the many types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating. They are an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. Investigate this valuable shop tool, illustrated in new catalog. Three sizes: Model "C," ⅓ hp — 9" to 13" lathes; Model "B," ½ or ¾ hp — 13" to 18" lathes; Model "M," 1 or 1½ hp — 18" to 72" lathes.



MODEL "M" PROVIDES OPPOSED MILLING HEAD ON HORIZONTAL MILL

MASTER MILLING ON TURRET LATHE COMPLETING PART IN ONE SET-UP

WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

MASTER MANUFACTURING CO.
1322 EAST AVENUE A
HUTCHINSON, KANSAS U. S. A.

power to supervise. The committee soon would be so strong that they would operate the department.

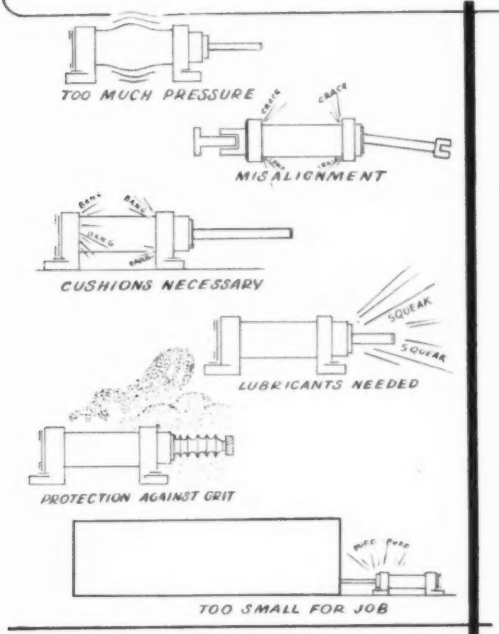
Since we realize the danger of this idea, let us look for the reason for a suggestion like this from Al. We must assume first that Al is a man of average intelligence and that he knows the work and how it should be done. He knows how to actually do it because some years ago he worked as one of the boys in the department that he is now supervising. Higher management saw in Al the potentiality of a satisfactory foreman. He seemed to have a better knowledge of the work than anyone else. He was well liked and was made a foreman.

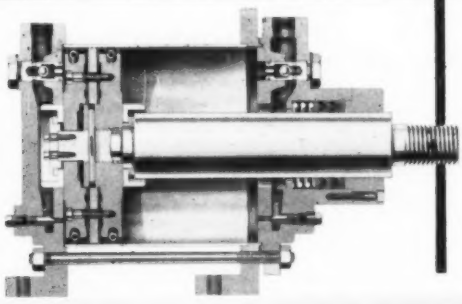
What did Al know about management of a group of men? Nothing. That was not a factor that was given any consideration by the company. He'd get by okay. Al was a smart man. And on this basis he was given the job. Perhaps he was handed a fistful of papers telling about the company policies but worded in such a complicated manner that it defied easy reading and understanding. These papers were to be his guidebook. The material covered only about one-eighth of what Al had to face each day. No one gave him assistance. His boss gave him, perhaps, the brushoff if he asked questions, or maybe the boss told him he was doing a great job, regardless of whether he was or not.

Now comes the day when Al must either hire or fire his men. What should he do? His guidebook tells him nothing except the regulations; maybe it does not even cover this phase of company policy. The foreman is now in trouble. Sure he finally stumbles through and no one says a word about his choice. Yet no doubt someone has observed it

"You mean . . . this is goodby?"

How your CYLINDERS can Last Longer





WHEN YOU INSTALL an air cylinder you want to insure the long life and trouble-free performance for which the cylinder was designed. Cylinders of ample capacity for the job should be used . . . Operating pressure should not exceed maximum cylinder rating. Trouble is often caused by use of the improper cylinder mounting style and by the piston rod being incorrectly aligned with the load to be pushed or pulled. Where the atmosphere contains moisture or abrasive dust, piston rod protective boots are desirable. Speed control valves in the air line may be necessary, particularly in moving high inertia anti-friction loads horizontally. Standard cushions, or even "super" cushions may be needed. Filters and lubricators are desirable.

WHEN YOU INSTALL a HANNA® Air Cylinder you have the *best* assurance of long cylinder life . . . you have consistently efficient performance . . . you have minimum maintenance. Hanna Cylinders combine such important features as removable bronze check valves, piston-packing expander rings, floating bronze cushion sleeves, self-adjusting, spring-backed rod packings and two-piece threaded flange and head construction.

YOUR BEST GUARANTEE of carefree cylinder operation is your specification of Hanna Cylinders followed by correct installation. The Hanna Cylinder and Valve Line has sufficient breadth to best meet your particular power needs. Send for the new Hanna Low Pressure Catalog No. 236 to get full information on the complete line.

50th Anniversary 1901-1951

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1740 Elston Avenue, Chicago 22, Illinois

Simplify LARGE HOLE Tapping

with the new Procunier TAP KING

This lightweight, heavy duty tapping attachment was designed especially for difficult large hole tapping. Rugged, dependable, with a super-tap capacity of $\frac{3}{8}$" to 1" in steel and up to $1\frac{1}{8}$" in softer materials, the Tap King has been establishing production records. Many users report 50% production increases on large hole tap jobs and costly parts spoilage practically eliminated! And these are not isolated cases! Other users claim *spectacular* daily production gains. Production men report amazing savings in parts spoilage and consistent, more accurate maintenance of uniform tap depth—even on large *blind hole* tapping jobs! Check these unique features:

Exclusive 17 tooth spline drive from clutch to tap holder spindle, gives smooth, powerful drive, increases tapping accuracy and reduces strain, wear and vibration; new, sensitive yet powerful friction clutch drives tap smoothly, with finger tip control—drastically reducing operator fatigue resulting in more work in less time with less effort; ball and needle bearings assure longer, trouble-free life; reverse speed is twice forward speed; simplified oiling system; aluminum housing; PLUS many other unusual features.

NEW! LARGER! "TRU-GRIP" TAP HOLDER

Makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter, it drives the tap by the square holds it true by the round.

WRITE FOR CIRCULAR

giving complete specifications and details on this amazing new Tap King tapping head. It shows how you can readily adapt this tapping attachment to fit your particular needs. In addition, a diagrammatic cross section drawing of the entire head and exploded view of the famous Procunier clutch and exclusive spline drive, clearly reveals why the Tap King is rapidly becoming the favorite "large hole" tapper in the industry.

PROCUNIER SAFETY CHUCK CO.
14-18 S. Clinton St., Chicago 6, Ill. Dept. 11B

Gentlemen:

Please send me full details on the New Procunier "TAP KING" Heavy Duty Tapping Attachment.

Name

Address

City Zone State

Procunier
Safety Chuck Company
14-18 S. CLINTON ST. CHICAGO 6, ILL.

and made a mental decision regarding Al's ability to select men.

More time wears on and not a bit of help or guidance in foremanship is offered Al. Suddenly he has the idea that maybe he could get rid of the responsibility which he does not realize makes him the foreman. "Let the men in the shop decide if the new guy is any good—they work with him" . . . so decides Al. How tragic a stand for a foreman to take. Yet who is to blame? Did anyone help the foreman to know his job? Did anyone guide him in the early days as foreman? The answer is definitely no. It then becomes obvious that the company which so glibly took a man from production without training and made him a foreman has committed two crimes. One . . . they have broken a man and have forced him to resort to the easiest way out, the let George do it method. Secondly, they have by not properly training personnel allowed highly organized groups to gain power and thereby placing the operations of the company at the mercy of these groups. No company can afford to not properly train their supervisors. This means the survival of Free Enterprise.

Charles D. Townsend
West Hartford, Conn.

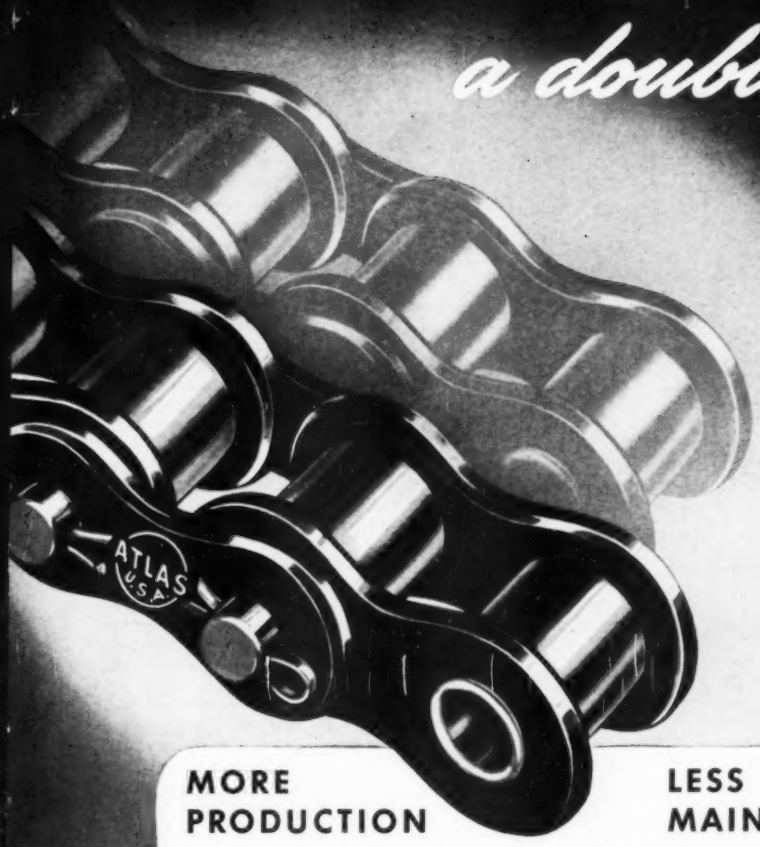
Short Course Ups Foreman's Economic Know-How

ATTITUDE-FORMING information on economic problems has been given first-line foremen at Republic Steel Corporation with a resulting 29.5% increase in their economic knowledge and a 19% improvement in their economic opinions. As foremen are an excellent means of communication with the rank and file, it is expected that many of the company's 70,000 employees will obtain a better understanding of what the growth of a socialistic state would mean to the individual, the company, and the country.

The program, developed jointly by Republic and the Industrial Relations Center, University of Chicago, is given on company time and consists of 13 sessions, each of $1\frac{1}{2}$ hr. The initial session usually is devoted to breaking down the participant's reserve because he approaches the program with some mental reservations.

Interest quickens with the second session when the discussion centers on personal economic problems. Ex-

CHAIN THAT LEADS *a double life!*



MORE PRODUCTION

Boosting output of present drives! Atlas Roller Chain is bringing this benefit to plants everywhere.

That's because Atlas Roller Chain provides a positive sprocket grip which makes possible the delivery of full rated horsepower without slippage or friction.

This means that your machines can run at full rated speeds and give greater output . . . with Atlas on the drive.

LESS MAINTENANCE

Here's why: The bushings and pins are case hardened by the Atlas Nicarb Process which provides greater inherent strength. Link plates and rollers are also made of tough, heat-treated alloy steel.

This means better chain performance . . . less chain maintenance.

For maximum production plus long, trouble-free service, install Atlas Roller Chain! Write today for the new Atlas Catalog and Handbook No. 51-AM.

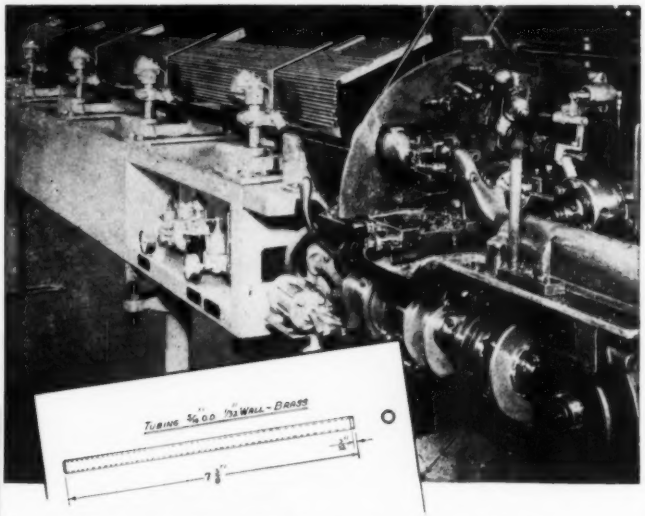
ATLAS CHAIN & MANUFACTURING CO.
PHILADELPHIA 24, PENNA.

ATLAS

ATLAS ROLLER CHAIN

Increases Actual Gross 71%....

Produces 94% of Increased Gross!



Another Screw Machine Record with

LIPE *Automatic Magazine Loading* BAR FEED

THE JOB—Part shown above made by Trico Products Co., Buffalo, N. Y., on #00G B&S Screw Machine. Length of this part required 7 feed-outs of the feed fingers. Cycle time: 3 secs.—an actual gross of 1200/hr. Best average production with one man handling this and one other machine: 600/hr.

THE IMPROVEMENT—Lipe Automatic Magazine Loading Bar Feed was installed on machine producing part. Cycle time cut to 1¾ secs. Actual gross upped to 2057/hr. A.M.L. Bar Feed, eliminating "cutting air," obtained 94% of actual gross, or 1930 pieces per hour. *A production increase of 221%!* Further savings: Same operator now runs *four* machines, two equipped with A.M.L. Bar Feeds.

THE LESSON—By feeding stock through the collet much faster, Lipe Automatic Bar Feeds increase production on the great majority of screw machine work pieces.

BIG Production Gains on a wide variety of work, BECAUSE—

- Stock is fed to screw machine all the time—not dependent on operator.
- Feed-out pressure always behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feed-outs.
- Model AML gives maximum output of machine—no "cutting air."
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem—no obligation.

LIPE ROLLWAY — *Lipe* – ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

amples and figures used then can be adapted by each class member to his own personal life. Here, as in many of the sessions which follow, concrete examples from the company's files are used in discussing wages, prices, better living, profits and costs, until, at the midway point of the course, the discussion centers wholly upon Republic Steel.

Republic Steel's economic position, its current balance sheet, and its current income statement constitute the subject material for three full sessions. Following session are on the nation's progress, money and banking, inflation, security, and what lies ahead.

While the first and the second sessions are usually more or less stilted, by the end of the third session, the chief problem of the discussion leader is not for participant's discussion, but rather to keep the discussions centered upon the subject being discussed. By the time the last session is held, the usual experience is that each of the 25 class members has developed not only very firm ideas on economic problems and questions, but believes himself entitled to the time necessary to expound upon such ideas for the benefit of his fellow class members.

Thus, far 3,500 of Republic Steel's 7,000 supervisors have been trained and top management has regarded results with such an approving eye that IRC and the company's representatives are now well along with a "post graduate" course for those who have completed the course in basic economics. That course will deal only with current problems, will be offered to all who have completed the primary course.

"I misplaced my French—curve."

5500 military planes this year...

means millions of welds—
over 90% of them are being produced with
Sciaky Spot and Seam Welders

WHAT'S so important about this fact? Simply this—the overwhelming preference for Sciaky machines in this most critical of all welding is proof of the superiority of Sciaky Three-Phase resistance welding.

Developed and pioneered by Sciaky, the Three-Phase Principle is now the accepted method of resistance welding as was the Sciaky Storage-of-Energy Principle during World War II. Because of its versatility the Three-Phase Principle has now made Sciaky resistance welding a practical answer to joining requirements for many ferrous and non-ferrous metals in a wide variety of industries. It can work for you . . . and Sciaky engineers will show you how. Write for bulletins describing the Three-Phase Machines.

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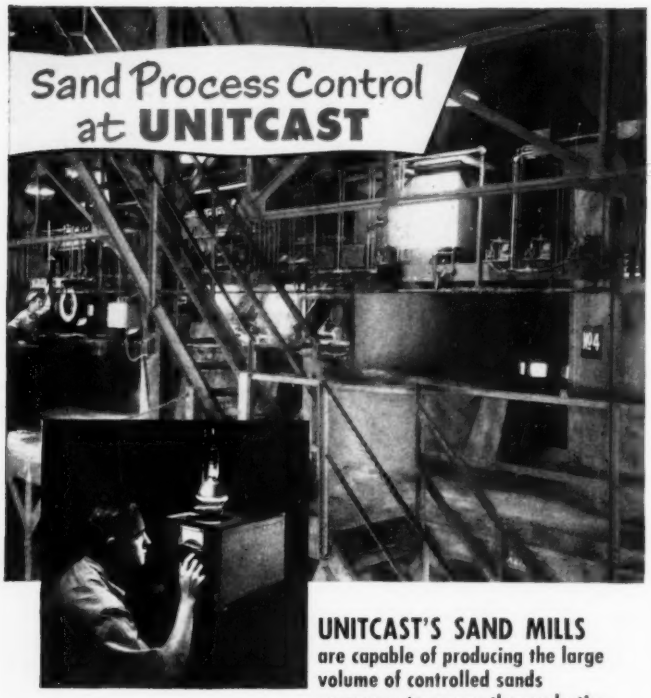

UNITCAST'S SAND MILLS
are capable of producing the large volume of controlled sands necessary to assure the production of top quality Unitcastings.

The new moisture tester pictured in use has an infrared drying lamp. The unit is a completely enclosed torsion balance, with dial calibrated directly in percentage of contained moisture.

Striking evidence of the adequacy of Unitcast's production equipment backed by continual laboratory control. Sands are milled with exacting care and thoroughly tested in Unitcast's completely equipped sand and testing laboratory to guarantee the production of highest quality Unitcastings.

A graphic example of the coordination existing between production and laboratory control departments at Unitcast.

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Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends. Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

New Finish Extends Possibilities for Magnesium

A NEW FINISH for magnesium, recently developed in the Pitman Dunn Laboratory at Frankford Arsenal, has excellent resistance to corrosion, high hardness and resistance to abrasion, and much greater resistance to heat than has magnesium. Called HAE after its discoverer, H. A. Evangelides, the new process produces electrolytically a hard, refractory ceramic coating in a manner similar to anodizing.

In salt-spray corrosion tests, HAE treated J-1 alloy panels showed no corrosion after 90 hours and when coated with wax were exposed more than 4,500 hours without sign of corrosion. Abrasion tests using the Taber Abraser with CS17 wheel and 1000g weight produced no breakdown of the coating after 8000 cycles. By comparison, specimens having dichromate, alkaline dichromate, and galvanic anodize treatments showed breakdown after 5 cycles.

Thickness of the coating is approximately 0.001 in. to 0.0015 in. depending on the length of treatment. The over-all increase in thickness of the treated object is approximately 0.0008 in. to 0.001 in. per surface for a 1.5-hr treatment.

While the color normally is brown of varying shades, a hydrofluoric dip lightens the shade and also removes residual alkali on the surface, thus insuring a good paint base.

Development of the new coating now may permit a variety of applications for which magnesium was not considered practical or economic.

"Listen, you . . . you better keep your trap shut!"

ANOTHER RED RING "First"

100" Gear Shaving Machine

The first gear shaving machine of its type ever built is the new Red Ring Model GCT which shaves both internal and external spur and helical gears with pitch diameters up to 100" and face widths up to 40". It is especially applicable to the large gears used in tanks, power shovels, mine hoists, speed reducers, stationary prime movers and marine drive units.

Outstanding characteristics of this machine are its high degree of accuracy in shaving large gears, its ingenious aids to rapid loading and unloading and the ease with which it can be set up.

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The Barrett "Filwhirl" is a Centrifugal Enameler providing a clean, sure and economical way of applying finishing materials to parts or products that can be rotated in fair balance in the revolving bowl. It wastes no coating material, and reduces time and expense when compared with other methods of applying a good commercial finish. It is designed for bulk handling, and can be depended upon for speedy production requirements.

It has proven highly successful in the coating of helical springs, clips, clasps, zipper parts, bead and link chain, toys, automobile and luggage hardware, misc. metal stampings, castings, etc. Excellent results are also obtained with japan, lacquers, varnishes, paints, waxes. No drips or fatty edges.

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Send a few representative samples to be processed and submitted for your examination.

The Barrett Centrifugal Enameler.

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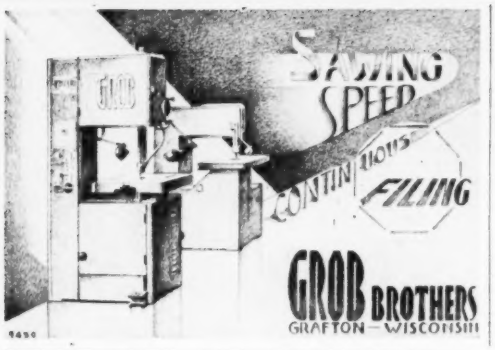
Designers and Builders of Centrifugal Machinery



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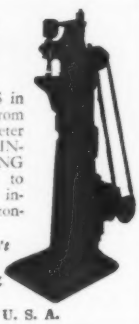

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. . . for precision work

Arch Sub-Press

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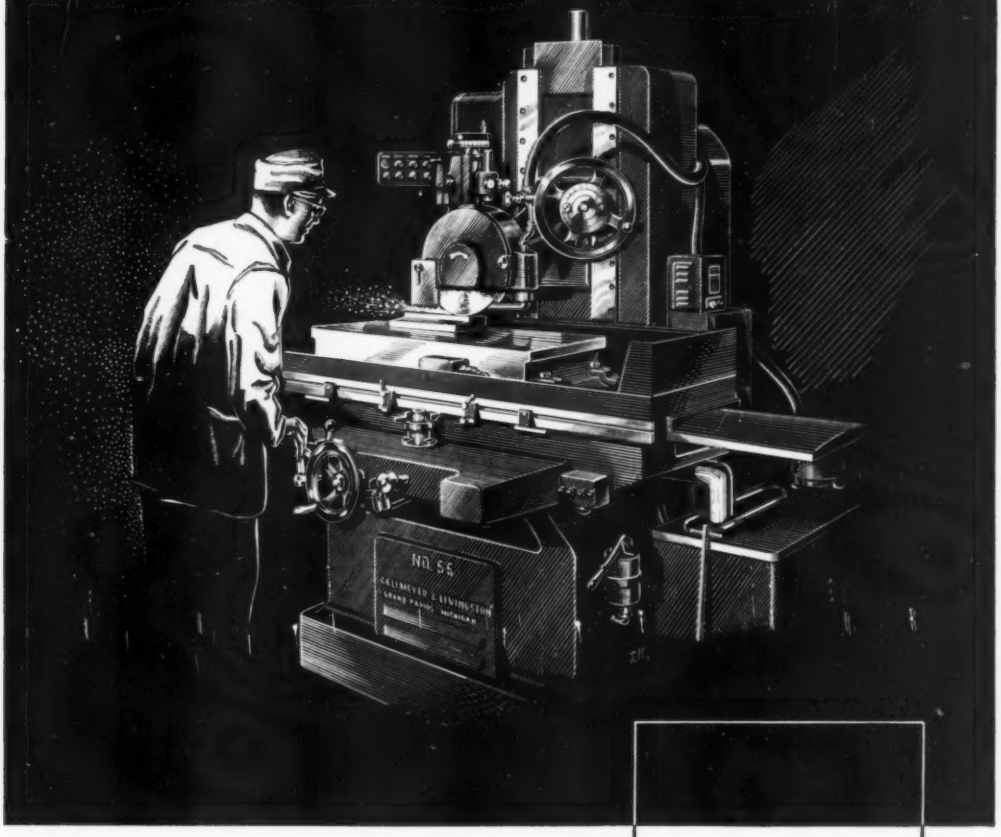

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THE common belief that "perishable tools" are written off when they go out to the machine is one of today's most expensive notions. Unless control is exercised *in use* as well as in stocking, the machine, method or man that breaks or ruins an excessive number of tools is never spotted. In one test, ratio of tool use on two machines of the same type on the same job was 1 to 7.

. . . dozens of man-hours— by a few minutes of Radiography

THERE'S a lot of skilled machinist time invested between a cast bronze blank and a finished precision gear. And it's time all lost when you wait until the cutting tool exposes a gas hole or other irregularity in the casting causing rejection.

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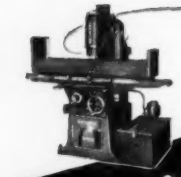

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Work Capacity: 24" long, 8" wide, 12" high.
Spindle: Built-in 5 hp motor, 3450 R.P.M. ball and roller bearing.
Wheel Size: Segment type, 6" diam.
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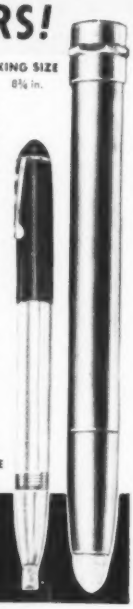

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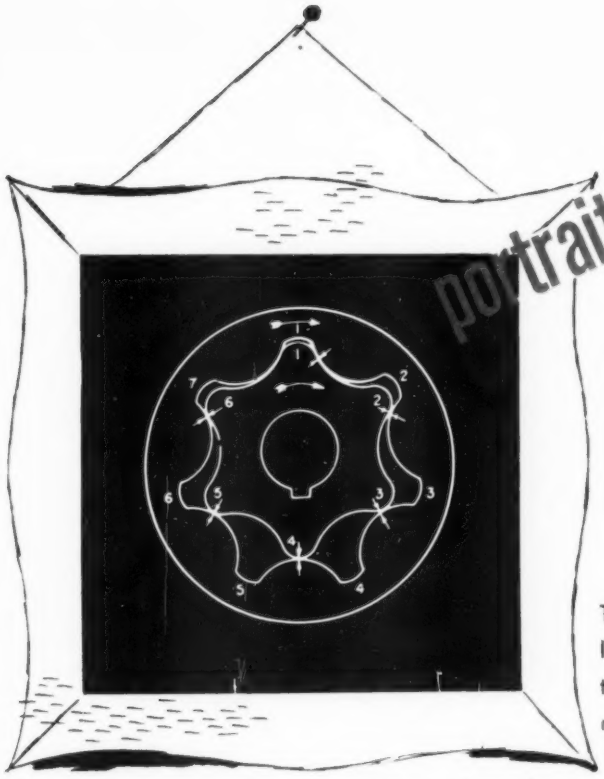

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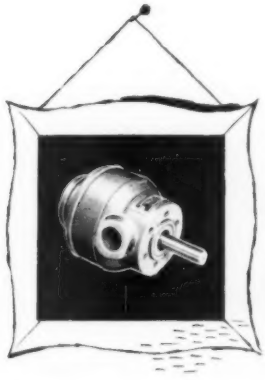
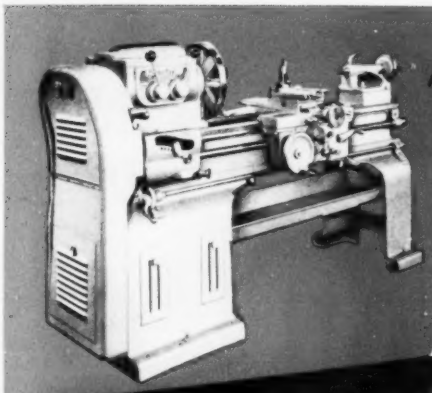


GEROTOR hydraulic pumps



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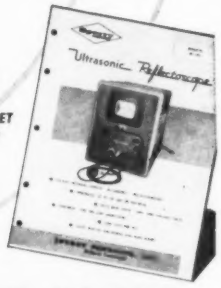

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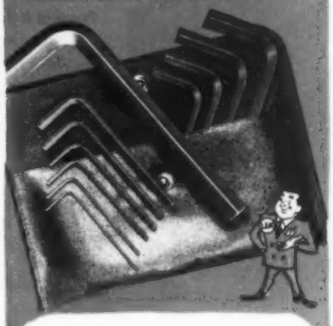

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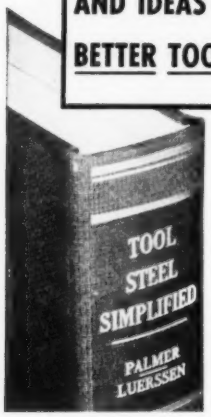

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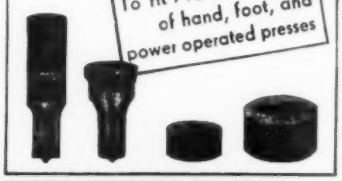

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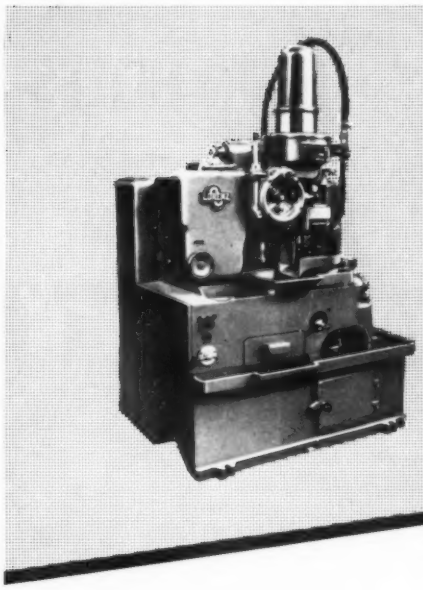

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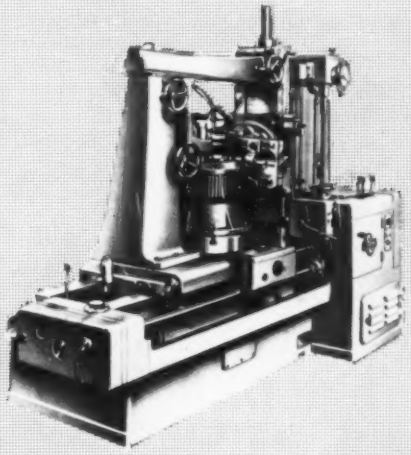

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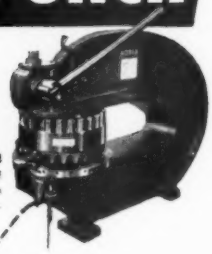

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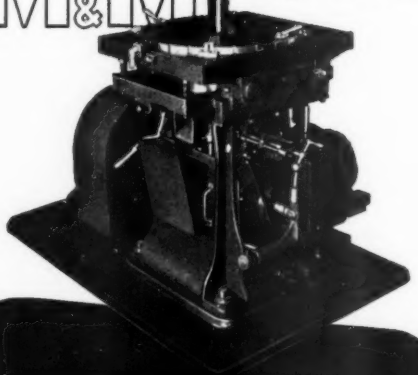

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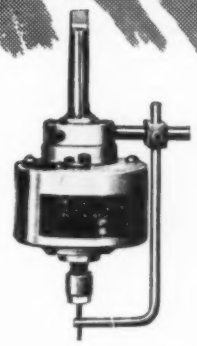

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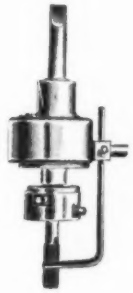

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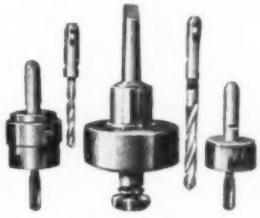

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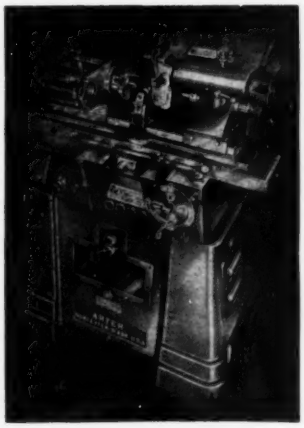

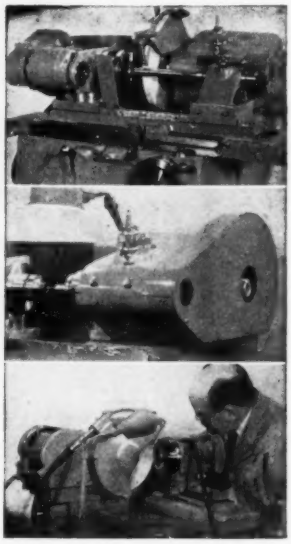

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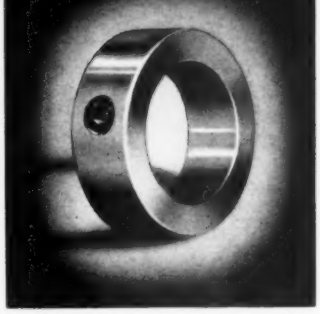

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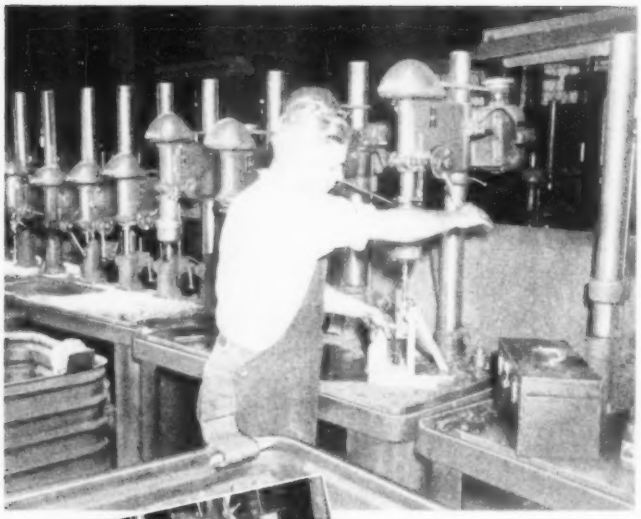

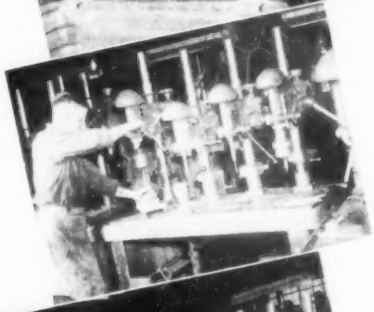

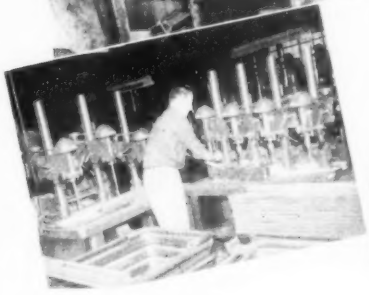

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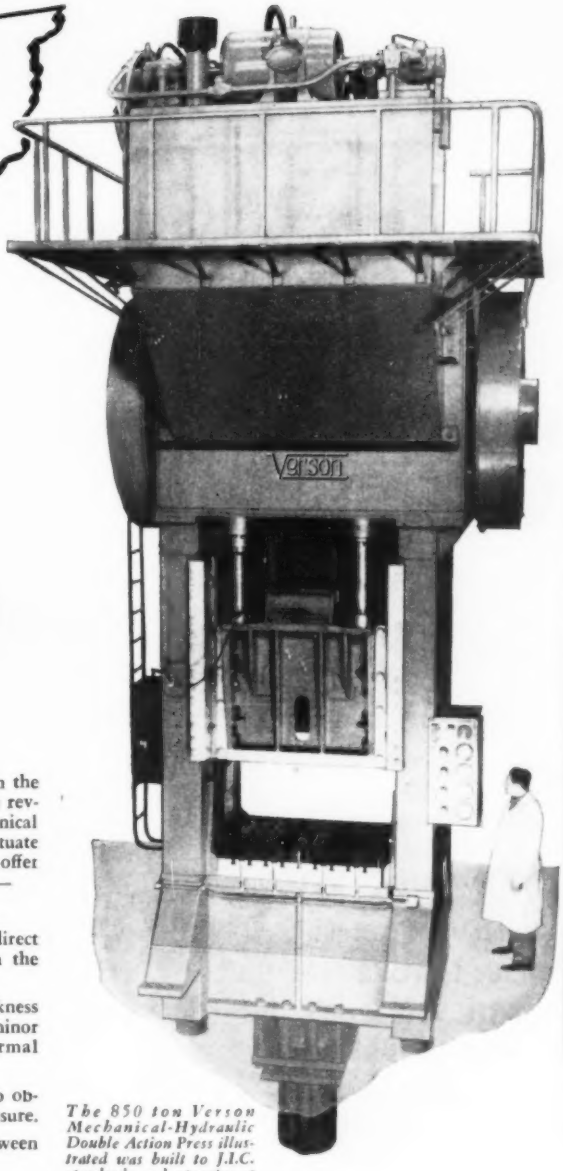

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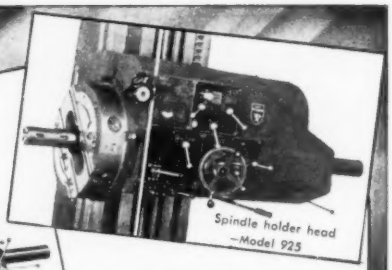

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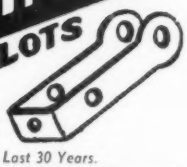

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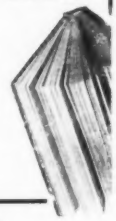

4. **Presents 190 specific approaches to materials handling problems used successfuly in industry by 145 different companies.** With facts, materials, methods, illustrations, and data, these case studies cover materials handling in receiving and shipping, machine lines, production and finishing operations . . . as well as assembly lines, in packaging, storage, etc. Each study is indexed by author, company, product handled, equipment used. **By Lewis K. Urquhart, Managing Ed. and Carroll W. Boyce, Ind. Prod. Ed., Factory Management and Maintenance. 440 pages, 738 illus., $8.00**

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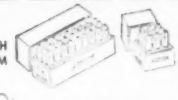

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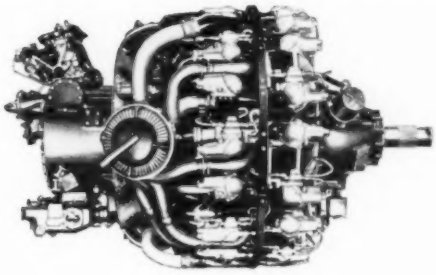

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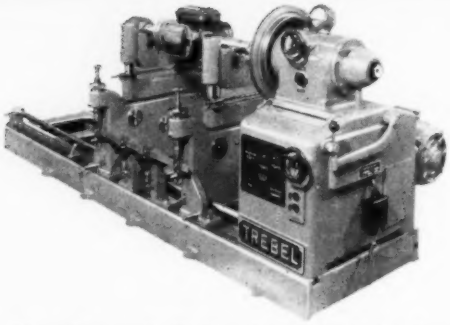

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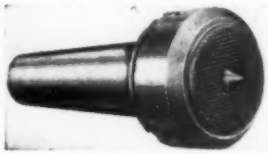

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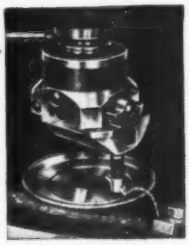

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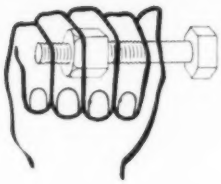
DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

IT GRIPS THE BOLT



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Gripco LOCK Nut lives up to its name! It grips the bolt so firmly that bolt and nut practically become a single unit, which resists vibration, strain, oil or chemicals.

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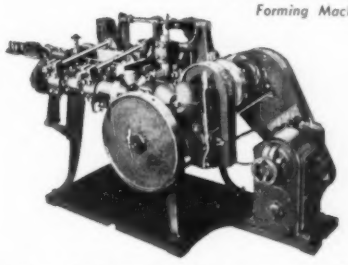

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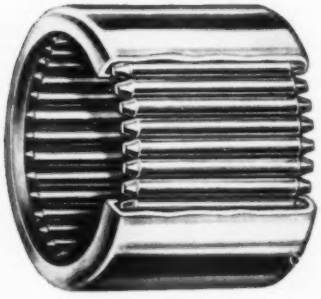

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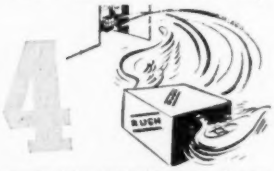

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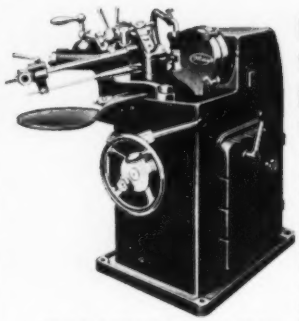

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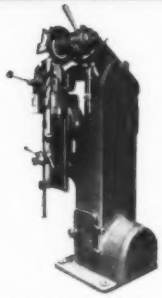

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. . . means

WITH SUCH COMPLETE FACILITIES AS THESE...

PORTLAND REBUILDING SERVICE is made possible through complete machining facilities such as are offered by:

—lathes from 16" to 140" swing
—boring lathes up to 70' capacity
—turret lathes
—vertical turret lathes
—vertical boring mills up to 50' capacity
—planers up to 14' between housing and 40' tables
—planer type milling machines
—gear hobbers up to 96"
—crane capacity to 50 tons, etc.

PORTLAND MACHINE TOOL

EAST YARD, SOUTH PORTLAND,

DESIGNERS AND BUILDERS OF SPECIAL MACHINE TOOLS, FABRICATING

PROMPT MODERNIZATION

...at big savings!

BRING YOUR MOST DIFFICULT REBUILDING JOBS TO PORTLAND

Give your old big planers, boring mills, millers, lathes—in fact give any machine tools, large or small, a new lease on life by having PORTLAND re-build them for maximum productivity, convenience and accuracy. PORTLAND has the "know-how," facilities and ability to give your present machine tools *new* speed, *new* output, *new* productive performance.

REBUILDERS, INCORPORATED

MAINE • PHONE 5-0651

EQUIPMENT, INDUSTRIAL EQUIPMENT, STEEL MILL EQUIPMENT

IMMEDIATE DELIVERY
HARD TO FIND MACHINE TOOLS

No. 00, No. 0, and No. 2 Brown & Sharpe Automatic Screw Machine and Turner Drives.

6½" RAC Acme Gridley Automatic Screw Machines, serials 40511, 40512 and 40257—late (3).

4½" Cleveland Model A Automatic Screw Machines, serial ♯34486.

1⅜" Model A Cleveland Automatic Screw Machine, late—(2).

1-1/16" Model A Cleveland Automatic Screw Machine, late.

24" Bullard Vertical Turret Lathe, New Era.

No. 3A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 4A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 3 Cincinnati Hi-Power Vertical Milling Machine.

36-90 Cincinnati Hydromatic Duplex Milling Machine, serial ♯3B38D1L-1, late.

No. 3VG Reed Prentice Vertical Mill, late.

No. 12 Brown & Sharpe Production Mill, late.

No. 14 Cochrane-Bly Universal Mill Shaper.

Wickman Precision Profile Grinder, late.

Norton Tool & Cutter Grinder.

16" Buffalo Geared Head Drill Press, late.

3" Gleason Bevel Gear Generator, late.

12" Gleason Combination Bevel Gear Generator, late.

50 Ton Henry & Wright Dieing Machine, Reeves drive.

Agents for Cincinnati Lathes and Canedy-Otto Drill Presses

• **SCARCE MACHINE TOOLS.**

MACHINE TOOLS

TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

SHELL DRAWING PRESS

30" stroke, 200 Ton Verson Model ♯40 ES, 1943 machine, Straight Side, 30 HP motor.

TOGGLE DRAWING PRESS

500 Ton, Model ♯410-A, "Bliss", 62" shut height, 60" x 84" bed area, 25" and 17" strokes.

DOUBLE CRANK PRESS

255 Ton, Model ♯96-D Toledo Try-Out Press, 30" shut height, 42" x 84" bed, 6" stroke.

Also

150 Ton, Model ♯60-D-84, Cleveland 12" stroke, 30" shut height, 46" x 86" bed.

PAUL'S MACHINERY CO.
6111 VERMONT DETROIT 8, MICHIGAN

ROLLER LEVELLERS

McKay ½" to 2", 4 High Leveller, 17" dia. rolls, 13 rolls, backed-up, 1943 machine, 350 HP motor, Selling for 1/5 of New Cost, Used only 6 months.

McKay ¼ to 2", 2 High Hot Plate Leveller, 15" dia. rolls, 150 HP, 13 rolls.

PAUL'S MACHINERY CO.
6111 VERMONT DETROIT 8, MICHIGAN

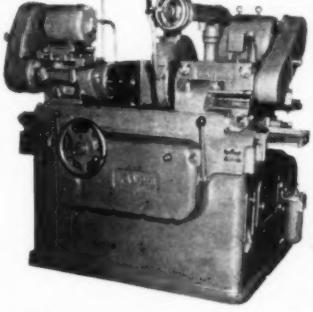
BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

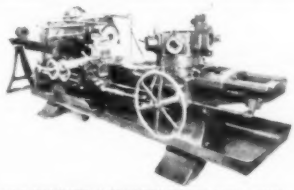
AUTOMATIC, #00 Brown & Sharpe, 5-16" cap.
AUTOMATIC, Cleveland Model #B-1½" Sgl. Spdl.
AUTOMATIC, B & S #2G, 1" Cap. M.D.
AUTOMATIC, #53 Acme-Gridley 4-Spdl, 1" Cap.
AUTOMATIC, National-Acme Sgle. Spdl. 4¼".
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar
BORING MILL, Ryerson #11, Horiz. 5½" bar.
BORING MILL, #0 Giddings & Lewis, 3½" Bar.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, Bullard 36" Rapid-Prod., M.D.
BARRELS, Tumbling, Lupomatic, Baird.
BORING MILL, Cleveland Horiz. 2½" bar, cap.
BUFFER, Model #95 U. S. Electric, 4 speed.
BROACH #3 LaPointe Horiz. 50" Str.
COMPRESSOR, Chicago Pneumatic 178 CFM.
CRANE, OET Shaw 10 tons, 58'6" span.
CHIP WRINGER, Barrett #251, M.D., 18" dia.
CUTTER, 74" Oswego Automatic Paper, M.D.
CRANE, OET Ricker 2 tons 11'9" span.
RADIAL DRILL, 4'x11" Cinc.-Bickford, M.D.
RADIAL DRILL, 6'x15" American, M.D.
RADIAL DRILL, Cinci.-Bickford 3½x9", A.C., M.D.
RADIAL DRILL, Cinci.-Bickford 5' arm, 13" col.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, Cincinnati 21" with Tapping Attach.
DRILL, Natco Multiple Spindle #12, #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILL, #2MS Leland Gifford, 4 spindle, #2 M.T.
DEEPFREEZE, Cascade 120° F., Industrial Chilling.
FILING, #3 Thiel & Sewing, M.D.
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Machler Steam Oven, Serial #3543.
GRINDER, Disc, Besley #205, 18" Dble. End.
GRINDER, Arter 16" Rotary Surface.
GRINDER, Cylindrical, Brown & Sharpe #2 Uni.
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, Heald Rotary #25, M.D.
GRINDER, Hydraulic Contour Landis Cam 5"x40".
GRINDER, Cylindrical, Norton 10"x24".
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Brown & Sharpe Cylindrical #10, 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Filmatic.
GRINDER, Thread, Jones & Lamson #TG-615.
GRINDER, Landis Crankshaft 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 14x36 Vert. Surface.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic.
GRINDER, #51 Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface.
GRINDER, #22 Heald Horiz. Rotary Surface.
GRINDER, Diamond Snagging 10 HP, 24"x41¼".



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

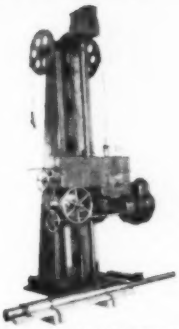
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 18" dia.
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3-16".
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
KEYSEATER, #6 Mitts & Merrill Giant M.D.

BENDING ROLLS
Hilles & Jones #6 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x¾" Plate. Top roll—22" dia. Lower rolls—15" dia. Imm. Deliv.



#3A WARNER & SWASEY Turret Lathe, M.D., Bar Feed.

LATHE, Buffing Dble. End 2"VMTS, Devine Bros.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, Bridgeford 32"x16' Q.C.G. Grd. Hd.
LATHE, Lodge & Shipley 24"x8' Heavy Duty.
LATHE, LeBlond 24"x14' Q.C.G. Grd. Hd.
LATHE, Hendey 20"x10' Q.C.G., Taper Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, Lodge & Shipley 18"x8', Q.C.G., Gr. Hd.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, American 16"x6' Q.C.G. Grd. Hd.
LATHE, LeBlond 16"x6' Q.C.G. Taper Attach.
LATHE, Lodge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach.
LATHE, LeBlond 14"x6' Q.C.G.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach.
LATHE, Le-Swing 8"x108", M.D., A.C.
LATHES, TURRET, Warner & Swasey Univ. #4 1½".
LATHE, TURRET, Warner & Swasey #3A Univ. Grd. Hd. Bar feed, tooling & collets, AC Motor.
LATHE, TURRET, Simmons #2 Vari Drive 220 V.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Turret Oster #601 W.O. Rapiduction.
LATHE, TURRET, Warner & Swasey #6 Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #1 Bardons & Oilver Electric Head.
MILL, Nichols, Hand, Coolant, M.D. Late Type.
MILL, 2A Brown & Sharpe Horiz. Univ.
MILL, #4B Brown & Sharpe H.D., Horiz.
MILL, #14 Garvin Plain Horiz.
MILL, #0Y Brown & Sharpe Plain Horiz.
MILL, Van Norman M.D. Hand Mill, late.
MILL, Cinc. Horiz. #3, #4, #5, High Power.
MILL, Cinc. Vert. #3, #4 High Power.
MILL, Cinc. 18" Mfg. Type with Vert. head. Late.
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILLING MACHINE, LeBlond #4, Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING, MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex
MILLING MACHINE, K & T #2B, Horiz.
MOTOR GENERATOR SET, 100 KW Gen. Elec.
NIBBLER, #2 Savage Roller Die ⅜"x36" cap.
NIBBLER, Gray Turret Type ¼"x24" cap.



#11 Ryerson Horizontal Drilling and Boring Machine, 5½" diam. spindle.

OZALID Model "F" Whiteprint Machine.
THREADING, Staybolt Lassiter Millholland 1¼".
THREAD MILLER, Hanson Whitney 4"x9" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
PLANER, 48"x48"x12' Cleveland Openside.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank, 45 tons.
PRESS, #78½ Bliss S.S. 9½" Str. M.D.
PRESS, Robinson #5 O.B.I. 83 tons. M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Toledo 59¼ S.S. 440 ton cap. 8" str.
PRESS Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 68C Bliss Double Action, 3 crank.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.

LESTER PHOENIX DIE CAST MACHINE
Model HP-2-SF. For alum., brass, and magnesium. Late model, 1947. Used less than 100 hrs., Imm. Deliv.

PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH H & J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W240D, Onsrud, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade.
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x9" cap.
SAW, NS18-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed.
SHAPER, 16" American B.G. Motor drive.
SHAPER, 32" Cinc. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork #A-1 Rotary 60° Throat, 18 ga.
SPRUE CUTTER, Milwaukee 56 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

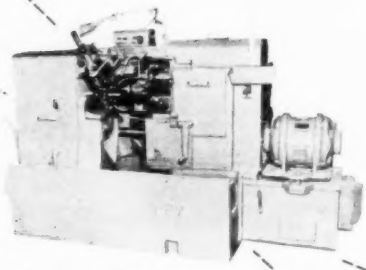
OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

THE FOCAL POINT FOR

PRODUCTION MACHINERY

IN AMERICA

- AUTOMATICS
- BROACHES
- BORING MILLS
- DRILLS
- GRINDERS
- JIG BORERS
- LATHES
- MILLS
- PRESSES
- SHAPERS
- ETC.



Model 60 New Britain 1" capacity, 6 spindle Automatic Screw Machine Serial No. 25995, complete with Threading Spindle and some Tooling.

When you want the finest in Production Machinery make Harvey Goldman your first source of supply. For three generations we have been accumulating experience and know-how in the machine tool business. Let us give you the benefit of our experience. *Write, wire or phone your requirements today!*

HARVEY GOLDMAN & CO.

3900 Schaefer Highway • Dearborn, Michigan

Telephone—Tiffany 6-4450

HEADLINERS

GRINDERS

14" PRATT & WHITNEY Model B Vert. Spindle Surf.
20"x144" Landis Plain Cylindrical, self-cont.
No. 49-53 Besly Vert. Spdle Disc, m.d.
No. 510 Oliver Drill Grinder, late

MILLERS

No. 00 Sundstrand Hydraulic "Rigidmil", m.d., late
No. 1-V Kent-Owens Hydraulic, m.d., late
48" Cincinnati Plain Automatic, m.d.
No. 2 Cincinnati High Power Plain, m.d.
No. 2-B Hvy Brown & Sharpe Plain, arr. m.d.
No. 2-B Milwaukee DOA Universal, spd
No. 2-M Cincinnati Universal, m.d.
No. 3-A Brown & Sharpe Universal, m.d.
No. 4-B Hvy Brown & Sharpe Plain, arr m.d.
32"x24"x16' Ingersoll Adj. Rail, arr. m.d.

LATHES

30"x132" centers American Hvy Pat 12-speed Grd. Hd., m.d., taper
24"x60" ctrs American Heavy Pattern 12-speed Grd. Hd., m.d., taper
24"x51" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
21"x136" ctrs LeBlond Heavy Duty, Turner Drive, taper
20"x96" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d., taper
20"x94" ctrs American Grd. Hd., m.d.
20"x70" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
16"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
14"x30" ctrs Lodge & Shipley 12-speed Selec. Grd. Hd., m.d.
11"x4' LeBlond "Rapid Production" High Speed Grd. Hd., m.d.
W. C. Lipe "Planers Carbo-Lathe", m.d., late
No. 1-A Warner & Swasey
No. 3-A Warner & Swasey
No. 3-L Gisholt
4"x34" Jones & Lamson "Hartness", clean

PLANERS

36"x36"x16' Cincinnati, 2 heads
36"x36"x18' Gray, 2 heads
42"x42"x14' Niles-Bement-Pond, 4 heads
42"x42"x16' Gray, 2 heads
48"x48"x12' Niles-Bement-Pond, 4 heads

MISCELLANEOUS

No. 17 Gleason Hypoid Bevel Gear Tester late
18" Gleason Str. Tooth Bevel Gear Generator
No. 7 Fellows High Speed Gear Shaper
Class "F" Bertsch Punch & Shear, 1¼" thru 1", 48" gap
32" Gould & Eberhardt Shaper, gearbox
No. 77 Toledo Open Back Press
18" Niles-Bement-Pond Slotter

Many other machines in stock. Send for stock list.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO

Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. O, 3" cap.
Giddings & Lewis No. 32, 3⅛" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Walker-Turner Radial, 2½'
Natco #12 20 spindle drill

ENGRAVERS

Auto Engravers Bench Type
Deckel Type GK2 3 Dimensional, New
Gorton #1A, ME
Gorton #3B 3 Dimensional
Taylor and Hobson 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #3, #2
Barber-Colman #12 Hobber (2)
Fellows High Speed Shapers 712, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

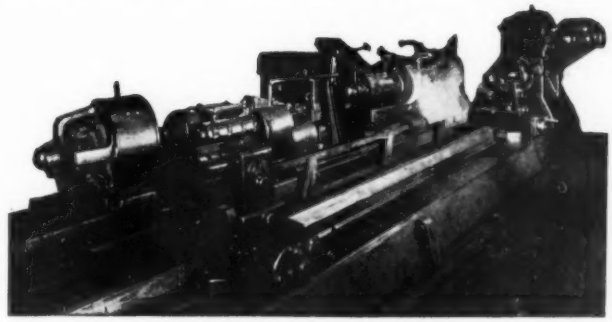
Bryant #5 Internal, chucking
Covel #91A Univ. Tool & Cutter
Gremby Int 1G-12, G-2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl.
Norton 16"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G
Pratt & Whitney Radius #R6, K.O. Lee Tool
Sellers GT Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE

Abrasive 8x24", #33 Vert. & #34
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base

LATHES

Bertram 28"x22' CC, Late.
Bridgeford 36"x20', 32"x16'
Lodge & Shipley #3 Duomatics



Norton Roll Grinder 50" x 28' (actual photo)

Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x54", 1941
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #21
Burke #4 Plain & Univ.
Cinn. 08 Plain
No. 2, 3, 4 Plain Spd.
Kent Owens 1V
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill
Van Norman #2 Universal

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #3, #4 hi-power
Cincinnati 08 Vertical
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162, OB
Bliss 41½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Ferracute EG54, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A13¼, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton
Zeh & Hanneman 40 Ton O.B.I.

TURRET LATHES

Acme 6W Fox 2 9/16" Cap.
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #2B 2½" Cap.
Gisholt #4 bar feed, Late
Gisholt #2L Cross Sliding Turret
Hardinge second operation
Jones & Lamson 2½" Saddle Univ. Late
Morey #2G Late
Oster 601WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A Timken Head
Warner & Swasey #5 Universal

MISCELLANEOUS

Automatic, Cleveland Model B 11/16"
Automatic B & S #00G

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
50 Ton William & White Gap Press, 20" St. 54"x20" Bed—24" opening
600 Ton William & White Up-Moving Ram 42"x60" platen 12" str., 24" opening self-contained.

MISCELLANEOUS PRESSES

30J Ton Watson Stillman 24x20" Platen 11" St. 21" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK

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14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
14"x8' Sidney Geared Head, m.d.
15"x6' LeBlond Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x58" centers Pratt & Whitney, cone, motorized
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' LeBlond, cone
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x8' Sebastian, cone
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6' Monarch Geared Head, m.d.
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18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' bed Boye & Emmes, m.d., taper
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Champion, cone
18"x8' Whitcomb-Blaisdell, Geared Head
18"x10' Bradford, cone, motorized
18"x10' Greaves-Klusman, cone, motorized
18"x12' centers American High Duty Geared Head, m.d., late type
18"x20' Monarch Geared Head, m.d. in leg
19"x8' LeBlond, cone
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x10' bed Lodge & Shipley Geared Head, m.d.
20"x10' Sidney Geared Head, m.d.
22"x8' Lodge & Shipley, cone
22"x10'6" Greaves-Klusman, cone, motorized
23"x12' LeBlond Geared Head, m.d., taper
23"x14' bed LeBlond Geared Head, m.d., taper
23"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lehmann Geared Head, m.d., taper
24"x18' Lodge & Shipley Selective Head, m.d.
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1-1 6" Cleveland, Model A. 1943.
2" Cleveland, Model A. 1942.

DRILLS

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16 Spindle Barnes, Hydraulic. 1942.

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DRILLS, SENSITIVE

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GEAR EQUIPMENT

No. 6 Gleason Revacycle Generator. 1940.
No. 645A3 Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
6" Red Wing Internal Shaver. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x46" Landis Type C. Pl. Hyd. 1943.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.

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No. 24-36 Bryant Hydraulic. 1943.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 1-2 Heald Hyd. Cap. 1940.
No. 81 Heald Plain Hyd. 1940.
No. 75A Heald, Two Motor. 1943.
No. 50 Heald Plain Hydraulic. 1941.

GRINDERS, SURFACE

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No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD

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No. ½Bx30 P & W Reamer. Latest.
No. ½Bx30 P & W Reamer. Latest.
No. ½Bx30 P & W Rifler. Latest.

LATHES, ENGINE

20"x20' Center LeBlond Heavy Duty. 1941.
22"x72" Monarch. 1943.
22"x48" Monarch. 1942.
16"x77" Axelson. Late.

LATHES, PRODUCTION

No. 3FU Foster Fastermatic Platen. 1942.
No. 3D Gisholt Simplimatic. 1939.
20"x23" Fay Automatic. 1942.
No. 12 Sundstrand Stub Lathe. 1942.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Mechanical Carbo. 1942.

LATHES, TURRET

1H5 Libby Universal. 1940.
No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS, PLAIN

No. 2L Cincinnati. 1941.
No. 4B Kearney & Trecker. M.D.
No. 3B Kearney & Trecker. M.D.

MILLS, PRODUCTION

No. 1224 Milwaukee Simplex. 1942.
No. 1-1B Cincinnati. 1942.
No. 0 Sundstrand Rigidmil. 1942.
No. 3A Sundstrand Copy Mill. 1942.
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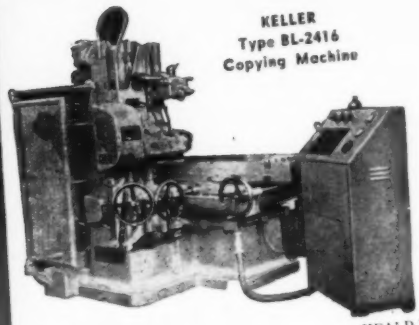

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FRANKLIN 4¾" Bar; table type; M.D.
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LANDIS No. 35 ft. type; 3½" bar; M.D.
NILES 8" bar floor type, motor drive

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COLBURN 72"; power rapid traverse; M.D.
NILES 53"; motor drive (heavy)

BROACHES

CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE S.R.V. 15-ton 48" Stroke, Late

DRILLS—Miscellaneous

BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
MOLINE 6-spindle Hole-Hog 3¾"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT

BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #1, #40 Tooth Rounders; M.D.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 & #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A, #8A gear generator; M.D.

GEAR HOBBERS

BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late.
GOULD & EBERHARDT No. 36H; Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late
PFAUTER RS1; max. dia. 30"; late

GRINDERS—Plain Cyl. & Univ.

CINCINNATI 6x18 cyl. Pl. Md.
CINCINNATI 14x48" Univ.; late
CINCINNATI 14x72 Model ER Plain, Late
LANDIS 10x56, 16x36 C Pl., Hyd., Late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr. M.D.
LANDIS 29"x130" centers Plain; M.D.
NORTON 6x30 plain; motor drive
NORTON 17x42" centers crankpin; Hydr. Dble hd.; M.D.

GRINDERS—Surface

BROWN & SHARPE No. 5; motor drive
BILLITTER & KLUNZ 48x 196" Way Grinder
HEALD #22 Rotary, Late Type
HEALD #25A Rotary, Motor Drive
PRATT & WHITNEY 14x 36" Model R, Late
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Misc.

BRYANT No. 3, 5, 16-C-16, 16-CP-16, 24 Intl. Hydr.; Late
COVEL #6 Univ. & Tool; NEW
EXCELLO #48 Carbide
GLEASON No. 12 Tool Sharpener; late
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES—ENGINE & MFG.

AMERICAN 25"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x33' centers geared; heavy
JONES & LAMSON "FAY" 20x25" Automatic; M.D., Late
LEHMANN 25x96" cntr; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft M.D.
LODGE & SHIPLEY 24"x96" centers, Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14"x42" centers "Z" Magnamatic Auto. TIMKEN M.D., Late
MONARCH 22"x456" Centers "CM" Precision; helical geared; TIMKEN; M.D.
NILES 30"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
PORTER McLEOD 16"x8' geared, 12 speed QCG; NEW
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.

LATHES—TURRET

MOREY No. 2 ram type TIMKEN
WARNER & SWASEY No. 4; bar; M.D.; Late
WARNER & SWASEY No. 3A Univ. Bar; M.D.
WARNER & SWASEY No. 5 Univ. Bar; M.D.

MILLING MACHINES—Plain

CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI 2-24 Timken; Late
CINCINNATI No. 3 Plain; rectangular; M.D.
SUNDSTRAND No. 3 Rigidmill; TIMKEN

MILLING MACHINES—MFG.

GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FENN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical

CINCINNATI 0-8 Mod EA Auto. PRT; Late

MILLING MACHINES—Thread

HALL Style D Planetary, Late Type
LEES BRADNER HT 12", 54", M.D.; Late
LEES BRADNER HT 12x36" M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

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BETTS CONSOLIDATED 108" x 84" x 44' 4 heads; PRT; Box Table; M.D.
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DETRICK & HARVEY 48"x48"x16' hydr.
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NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
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SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"x20'; 4 heads; M.D.

SAWS

ESPEN LUCAS No. 670 30' cap Hydr.; Late
HELLER Model SS-1, 6¾" Cap Cold Saw

SCREW MACHINES AUTOMATIC

BROWN & SHARPE 00G High Speed, Late
GYROMATIC Model 40 1⅝" 6 Spindle, Late

SHAPERS—SLOTTERS

CINCINNATI 16", Heavy; PRT; Late
DILL 18" Slotter; motor drive
LeMAIRE 18" Vertical Hydraulic; Late
PRATT & WHITNEY 6" Vertical; M.D.
PRATT & WHITNEY 10" Ver. Slotter
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" vertical, Hydr.; Late

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NATIONAL #5 Maxi-Press; tie rod (Forging); M.D.
NATIONAL #5 H.S. Maxi-press (Forging)
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS

AJAX 3½" forging, upsetting; M.D.
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D. Late
LANDIS 2" sgle. Dble. Spdle. Threaders, M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Rehsaders; Late
MANVILLE No. 3C Thread Roller; M.D.
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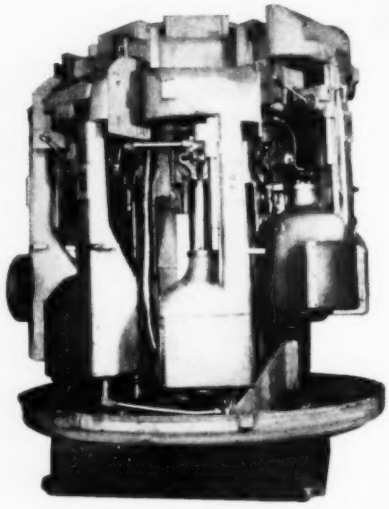

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BRASS LATHE, 21" Acme, Late, Hardened Ways
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FACE GRINDER, 84" Bridgeport 32" wheel
GEAR GENERATOR, 3" Gleason straight, Late
GEAR HOBBER, 36M Gould & Eberhardt
GEAR HOBBER, #12 Barber Colman
GEAR PLANER, "1" Rienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed 6IA, 6I, & 6AA, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 18"x48 Cinci., Cyl., M.D.
GRINDER, No. 8-T Sellers, Tool, '42
GRINDER, No. 16Y2B Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72AS Heald Internal, 1943
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, UNIV. 12"x30" Thompson M.D.
LATHES, 42"x30' cen. Putnam Grd. Hd. M.D.
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25"x12' cen. LeBlond Grd. Hd., M.D.
25"x12' bed Bridgeford Grd. Hd. (3)
24"x16' bed American T.A. Grd. Hd.
22" 46"x10' cen. Putnam Ext. Bed Gap M.D.
20"x48" cen. Amer., Eng. T.A. (3)
18"x10' bed L. & S. Select. Hd., T.A., M.D.
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12"x6' bed Reed Prentice, 14½" sw. Grd. Hd.
TURRET LA., No. 3AL Gisholt, 6¾" hole in spin
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No. 2B Foster Univ. 3½" capty. Bar, Timken #5 Gisholt, Air Chuck, '43
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New York Phone: LOngacre 3-1222

MacDell Availables in Late Type Guaranteed Machine Tools

Gisholt 3S Dynetric Balancer Mfg. 1942

Bardons & Oliver #2 Geared Electric Turret Lathe (2 available) Mfg. 1942

Heald No. 25A Rotary Surface Grinder. 24" Chuck Mfg. 1941

Knight #40 Vertical Mill. complete with jig boring equipment. Mfg. 1942

Brown & Sharpe No. 12 Automatic Mill 18" Table Travel Mfg. 1943

Brown & Sharpe No. 2 14"x30" Universal Grinder Complete Internal Attach. Mfg. 1942

Cleveland 3¾" Model A Single Spindle. Automatic with Tooling Mfg. 1943.

72A3 Heald Plain Internal Grinder, with Rod Head Spindle. Mfg. 1942

Landis Type 4H 4" x 12" Plain Hydraulic Cylindrical Grinder. Mfg. 1942

MacDell Corp.

1042 W. Lake St. **Chicago 7, Ill.**

TURRET LATHES

(2) Warner & Swasey Model #2M50 Capacity 1" Round Collet Hand Screw Machines, Chuckers. Serials #556, 154 and 556, 165 (1942)

(4) Warner & Swasey Models #2M70 Capacity 1" Round Collet Hand Screw Machines, Bar Feed Serials #555, 500, and 556, 200 (1942)

(3) Moreys Model #2G—Timken Capacity 1" Round Collet Power Feed to Turret, Bar Feed (1941-2)

(1) Libby (Gisholt) Model #3R—Ram Type Capacitly 2" Round Collet Power to Turret, Bar Feed Serial #1044 (1942)

(1) Libby (Gisholt) Model #3R—Ram Type Hole in Spindle 2-9/16" Power to Turret, Chucker, 20" Swing Serial #1102 (1942)

OLDER MACHINES

(1) Libby 5", Bar Feed, Heavy Duty (1930)

(1) Foster #5, Bar Feed, 1-13/16" Collet Cap. (1930)

(1) W & S #4, Bar Feed, 1½" Cap., cone head

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Ave., Brooklyn 17, N.Y.
Dept. "A" Phone: TRiangle 5-5237

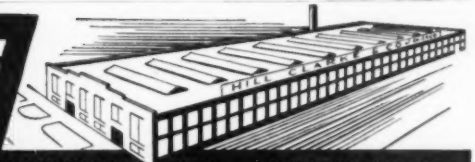
GRINDERS

No. 24A2 Hanchett Two Spindle Vertical Thru-Pass Rotary Surface Grinder.

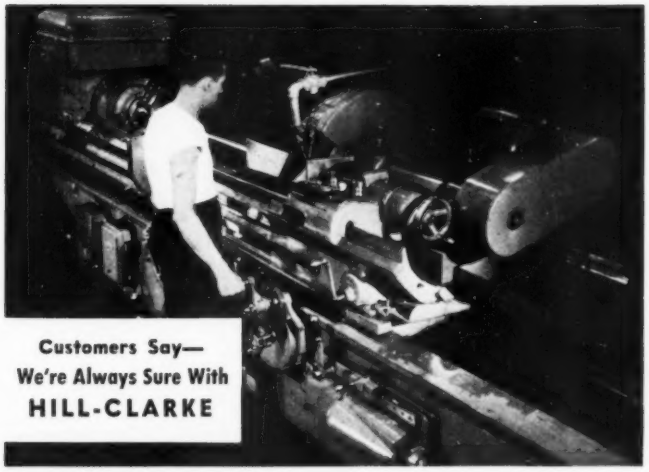
New 1945 — Very Good Condition

ALEXANDER & FIDEN
1014 Genesee St. Buffalo 11, N. Y.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary



"PRODUCES ACCURATELY WITH MINIMUM MAINTENANCE" SAYS CARRIER CORPORATION of this 18"x120" Norton Cylindrical Grinder purchased from Hill-Clarke and used to grind bearing journals on fan shafts. And this kind of dependable performance with every machine has made Carrier a satisfied customer of Hill-Clarke for eleven years.

AUTOMATICS

⅜" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)
1¾" Model G 4 Spdl. Gridley

DRILLS

1 Spdl—15" SW—No. 2 Avey, Cam Fd.
2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester ('42)
No. 64 Fellows Gear Shaper

BORING MACHINES

3" Lucas Hor. Bor. Mill
Rockford—3⅛" Bar
72" Niles—Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
No. 25-A Heald Surface Grinder
5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

MISCELLANEOUS

24" Milwaukee Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 307 Barnes Hone
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
75 Ton Hannifin Hyd. 4 post press
No. 175 Geo. T. Schmidt Marking Mach.

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke gives you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for RE-MANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization—with eighty-four years experience.

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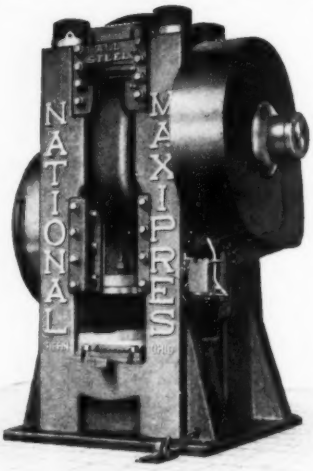
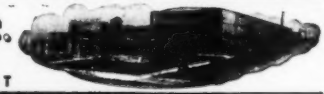
AVAILABLE IN STOCK
NATIONAL MAXIPRES



NATIONAL No. 2 MOTOR DRIVEN ALL STEEL-COINING MAXIPRES.
Capacity 500 Ton — Stroke 6"
Area of Bed L to R 20" — F to B 34"
1934 Machine — with 15 H.P. Motor

New, Used and Engineered Rebuilt Machine Tools

BOTWINIK BROTHERS INC.
313 WELTON STREET
NEW HAVEN 9, CONNECTICUT



OVER FIFTY YEARS OF RELIABLE SERVICE

AUTOMATICS
7/8" Gridley Model G
1 1/4" Cone 4 spindle
1 1/2" Cone 4 spindle
No. 454 New Britain chucking
14"x18" Monarch Magnamatics

BORING MILLS
84" Gisholt
34" King single turret
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

DRILLS
14" Leland Gifford 1, 2 and 4 spdl.
14", 4 spdl. Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 spindle
24", No. 4B Edlund, power feed
24" Cincinnati
No. 310 Baker
No. 217H Baker horizontal
Barnes horizontal radial
3' Carlton sensitive radial
6'-15" Dreses radial
14 spdl. No. E5 Natco (tapping)
16 spdl. No. 13 Natco multiple
36 spdl. No. 2 Baush
1 & 4 spdl. Avey No. 2, woodpecker feed
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable rail
6 spindle Kent automatic
Several 2, 3 & 4 way multiple with fixed center spindles

GEAR CUTTERS
8"-10" No. 1 Lees Bradner
14", No. 5A Lees Bradner hobber
24", No. 3 Adams Farwell hobber
No. 12H G&E
No. 130 Cleveland Rigidhobber
4" Gleason spiral bevel
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders

GRINDERS, CYLINDRICAL
10"x18" Norton, plain & semi-auto
10"x18" Landis hydraulic
16"x72" Landis mechanical
10"x18", & 10"x50" Norton mach.

GRINDERS, INTERNAL
No. 75 Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant
Grenby bench type

GRINDERS, SURFACE
No. 10 Blanchard rotary
16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)

MILLERS
No. 1 1/2B Kearney Trecker vertical
No. 2 Cincinnati, horiz.
12" Cincinnati plain mfg.
18" & 24" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
24" Cincinnati duplex
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll rise and fall
6 spindle Moline profiler
30 1/2"x21"x12" Ingersoll planer
48"x20"x20' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
No. CT 36 Lees Bradner thread
Nos. 4-6 Lees Bradner Univ. thread
4 1/2"x12"x6"x14" P&W thread

SHAPERS & PLANERS
20" Gould & Eber. shaper
24" Queen City shaper
27" Morton draw cut shaper
16" Bement Miles slotter
36"x36"x8' Cleveland openside

MILES MACHINERY CO.
BOX 770 SAGINAW, MICH.

MODERN MACHINES

#40 Landis Floor Type Horizontal Boring Mill
6D Potter & Johnson Automatic Chucking Machine
#35 Excello Thread Grinder
#61A Fellows Gear Shaper
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turner Drives
#3 Barber Colman Hobbing Machine
G1-A Acme Gridley 1 1/2 Automatic Screw Machine
16" Gould & Eberhardt Shaper
6 Spindle Allen Drill

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

SCARCE MACHINE TOOLS

NILES 10' Vert. Boring Mill, 2 Heads, M.D.
INGERSOLL Planer Type Mill, 4 Heads, 36" x 24" x 20'
CINCINNATI 36" x 36" x 16' Planer, M.D.
WOODWARD & POWELL 42" x 42" x 36' Planer, M.D.
HEALD #81 Centerless Internal Grinder
HEALD #22 Rotary Surface Grinders

National Machinery Exchange
138 Mott St. New York 13, N. Y.
CAnal 6-2470

16"x68" Landis crankshaft grinder motorized with chucks.

Hydro-Matic Sparks Simplex lathe 5" spindle hole, air collet chuck for stock 8" dia. late model

Cleveland Auto. tapper 1 1/2" cap. with lead screws, yr. 1944.

LATCH MACHINERY & SUPPLY CO.
701 East 96th St., Cleveland, Ohio, GLenville 1-2104

DIE CAST MACHINES

No. 7H & 7F Lester High Pressure with motors and pumps. New 1934.

ALEXANDER & FIDEN
1014 Genesee St. Buffalo 11, N. Y.

GUARANTEED MACHINE TOOLS

LATEST TYPES—1941-1951 MODELS

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
G&L: #3 Tool and Cutter Grinder
GLEASON: #12 Cutter Sharpener
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang 6 motor-driven spindles,
PROVIDENCE ENG: FV-6 Sensitive 6 motor-driven spindles, ⅜" capacity, high speed type
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Generator
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 24" long (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8LSI and 18LSI Gear Lappers. External & Internal Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE No. 23, capacity 10"x48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI, 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts
NORTON: 6"x18" plain, hydraulic
NORTON: 10"x18" plain, hydraulic

Grinders—Cylindrical—*Cont.*

NORTON: 10"x18" 45° angle wheel head
NORTON: Crankshaft Grinder, 23"x72"

Grinders—Cylindrical—*Cont.*

VAN NORMAN: #666 Crankshaft Regrinder, 20"x48"

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
GLEASON No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 112 with high frequency wheel head, 42000 rpm
BRYANT: #5 Internal
BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain, Internal
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
LANDIS: Hydraulic, 8" stroke x 15" dia.

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN : #3½ Universal, capacity up to 3½" dia.

GRINDERS—SURFACE

ARTEK: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

ECELLO: No. 31 external, dia. 5"x 18" centers
JONES & LAMSON: TG-1245 External, 12" dia. x 45" centers, with additional capacity if required

HONING MACHINES

BARNES: No. 306H Vertical, 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" diameter capacity
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8LSI and 13LSI Gear Lappers
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48": centers
LODGE & SHIPLEY: No. 3A Duomatic, 27" center
MONARCH: 24"x60" Geared Head
MICHIGAN: 1708 Relieving, 8"x24"

Lathes—Production—*Cont.*

MICHIGAN: 1712 Relieving, 12"x32"
WILLSON: 15" x 48" Geared Head Motor Driven (New)

LATHES—TURRET

HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 48" dia. (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
CINCINNATI: #0-8 Vertical Millers, Automatic Type
KENT-OWENS: #1-8 Hydraulic Plain Miller
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: #2 Face Mill Cutter Grinder
G&L: #3 Tool and Cutter Grinder
GLEASON: #12 Cutter Sharpener
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
CUT-OFF: Campbell, Abrasive 423 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: Screw, Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
RACK CUTTING MACHINE: Sykes 24" to 36" length capacity (New)
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New)

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MACHINE TOOL ENGINEERS SINCE 1919

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

PARTIAL LIST OF LATHES

Lodge & Shipley 30"x16' bed, 12 spindle speeds, drop lever handles in apron, taper attachment.
LeBlond 23"x12' bed, 16 spindle speeds, 7' center distance, taper attachment.
Bradford 20"x18' bed, 4 SCD., 12' center distance, Loose change, taper attachment.
American 20"x12' bed, 8 spindle speeds, 70" center distance, taper attachment.
Blount Model B3 Lathe for Turning, chucking, polishing and lapping, 20" swing, 8' bed.
American 48"x20' bed, Internal Face Plate Drive, 10' center distance, 2⅝" hole in spindle.
American 36"x40' bed, Internal Face Plate Drive, 33' center distance, 2⅝" hole in spindle.
Schumacher & Boye 36"x24' bed, Internal Face Plate Drive, 15' center distance, Turner Gear Box
Lodge & Shipley 24"x12' bed, 5 SCD., taper.
LeBlond 24"x10' bed, 3 SCD.
LeBlond 21"x10' bed, 3 SCD.
Lodge & Shipley 20"x8' bed, 12 spindle speeds.
Monarch 20"x6' bed, 8 speed head, drop lever handles.
Lodge & Shipley 18"x9' bed, Bowl head, 3 SCD.
American 18"x6' bed, Bowl head, 3 SCD.
Lodge & Shipley 18"x6' bed, 12 spindle speeds.
Monarch 16"x8' bed, 3 SCD.
American 16"x8' bed, bowl head, 3 SCD.
Lodge & Shipley 16"x6' bed, 12 spindle speeds.
Hendey 14"x6' bed, Yoke head, 4 SCD.
Monarch 14"x6' bed, 3 SCD.

TURRET LATHES

Oster 601 WD, late type.

BORING MILLS

Colburn 64", 2 heads on cross rail.

GEAR MACHINERY

Brown & Sharpe 3-26, with flywheel on cutter.
Gould & Eberhardt 18H Hobber.

GRINDERS, CUTTER

Sellers, 4T, motor driven, late type.
Sellers, 6T, motor driven, late type.

GRINDERS, DISC

U. S. Model 80, Double end, 7½ HP.
Gardner 24-53", vertical spindle.

GRINDERS, INTERNAL

Heald #78 Centerless, Internal & Cylindrical late type.
Micro, Model FG., new 1932.
Heald #70, new 1941.
Landis Thread Grinder, #6, new 1944.

HAMMERS

Nazel 6N, 40 HP motor.
Mayer 50# power driven.

MILLERS—AUTO. OR PROD.

Cincinnati 1-18 Plain Automatic.
Ohio 40" Tilted Rotary.

PLANERS

Niles 48"x18"x10' Timesaver Planer 25 HP DC motor and controls; two rail heads; 1 side head.

Liberty Planer 36x36x18' Double housing.
Cincinnati 24x24x6', belt drive.
Gray 24x24x6', belt drive.
Gray 36x36x12', spiral gear drive.
Cleveland Openside, 26x26x8'.

SHAPERS

Smith & Mills, 14", plain crank.
Gould & Eberhardt 16" gearbox drive.
Barker, 18", 4 SCD.
Averbeck, 21", 4 SCD.
Gould & Eberhardt, 24", gear box drive.
Columbia, 28" single pulley drive.

ROLLS

Niles Bement Pond Bending Roll, initial type, ⅜" capacity, motor driven.

WHEEL PRESSES

Niles Bement Pond 600 ton press, 12" ram, 8' daylight, triple plunger.

PIPE CUTTERS

Landis 2" Pipe Threading & Cutting Machine.
Wyland 6" Pipe Machine, belt drive.
Curtus 4" Pipe Machine.

PUNCH PRESSES

Robinson A-3, 2" stroke, 32 ton.
Bliss Coining Press, ¾" stroke.

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

No. 2 L & G 2-spindle Drill, P.F.
No. 3A High Speed H.D. Hammer.
Hardinge Model MD37 Lathe.
Waterbury-Farrel No. 0 Slotter.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

LEAF BRAKE

12'x1/4" DREIS & KRUMP. AC MOTOR DRIVE.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

GREEN BROS. of WORCESTER, Inc.

NEW, USED AND REBUILT **MACHINERY**
ELECTRIC MOTORS
957 Southbridge Ave., WORCESTER 3, MASS. Phone 6-8391

IMMEDIATELY AVAILABLE

GRINDERS
2—Landis 4H, 4"x12", Late.
1—Brown & Sharpe #2, 6"x18", Surface, P.F., Late.
2—Wicaco Internals, Late.
1—Gallmeyer & Livingston #1½ Tool & Cutter, Late.

AUTOMATICS
Conomatic 4 spdl., 4½" Tooling '44
#38 New Britain Gridley 8S, Chuckers, 1½", Equipped.
4½" Gridley 8S, Auto. Equip. Bar

TURRET LATHES
Acme #17—4½" Univ., Bar Chuck.

LATHES
Lodge & Shipley 18"x8', 12 Speed, G.H., M.D., Taper Attachment
Hendey Yoke Head 24"x8', Q.C., M.D., Taper Attachment
14" x 6' & 8' South Bends, Equipped, M.D., Late

PRESSES
Bliss #10IS Auto. Feed, 5 stations, draw ¾" deep
Bliss #102S Auto. Feed, 5 stations, draw 1½" deep

DRILL PRESSES
Edlund #2B—9" 4 Spindle, P.F., #2 Morse, Backgeared & Open-belt
Canedy-Otto 21", #4 Morse, Backgeared, Late

For Immediate Shipment . . . Anywhere

RIGHT FROM STOCK . . .

10" Gridley 4 Spindle Chucker
8" Cleveland 4 Spindle Chucker
Parker Tube Bender
6C Potter & Johnston Lathe
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Detroit Model DH2 Brinell Tester
D-1 Colburn Heavy Duty Drill
Moline 6 Spindle Rail Drills
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Sundstrand Vertical Mill, rotary table
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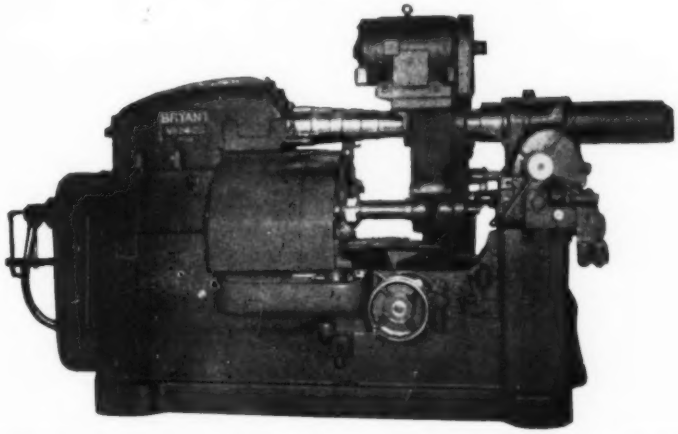

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Index of

PRODUCTS ADVERTISED

In This Issue

•

Abrasives, Coated 18-19, 32, 79, 196
Accessories & Attachments (Machine Tool) 75, 118, 234, 238, 246

Balancing Machines 264
Balers, Scrap Metal 290
Bearings 4th Cover, 31, 54, 84, 206, 267
Blast Cleaning Equipment & Supplies 211
Books, Technical 250, 262, 286
Boring, Drilling & Milling Machines (Horizontal) 3rd Cover, 14-15, 82, 110, 187, 260
Boring Machines (Internal) 2nd Cover
Boring & Turning Machines (Vertical) 14-15, 104
Broaching Machines 66
Brushes 83

Castings 240
Centrifugal Machines 242
Chucks 89, 96, 215, 266
Cleaning & Drying Machines & Supplies 83, 93, 205
Collets 81, 89
Controls, Electrical 26-27
Counters 28
Coolant Systems, Filters & Supplies 214
Cut-Off Machines; Sawing Machines 58, 242

Drilling Machines 29, 52-53, 56-57, 61, 78, 99, 103, 114, 118, 179, 201, 221, 257, 286
Drill Jig Bushings 106, 215
Duplicators & Pantographs 87

Fabricating Methods & Services 218, 246
Fasteners 207, 228, 249, 256, 260, 265, 266
Floor Drying Compounds 244

Gages & Instruments 30, 45, 48-49, 191, 211, 214, 228, 245, 248, 250, 261
Gear Cutting Machines 3, 6-7, 241, 251
Gears, Speed Reducers, Motor Reducers 71, 74, 233, 254

(Continued on page 286)

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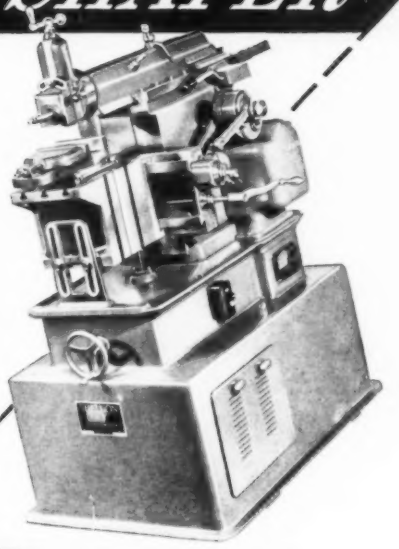

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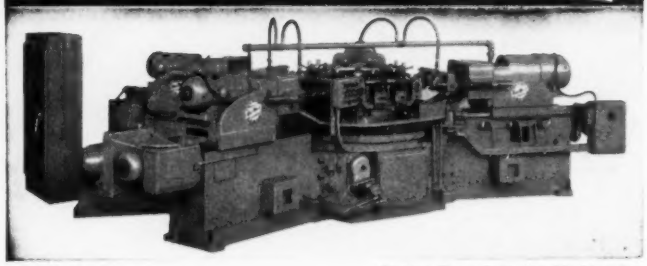

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Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 285)

Gear Testers 3, 6-7, 241

Grinders—Cutter & Tool 210, 250, 268

Grinding Machines—Production 2nd Cover, 4-5, 12-13, 17, 90, 189, 196, 213, 246, 250, 256

Grinding Wheels 17, 18-19, 79

Heads: Drilling, Grinding & Tapping 89, 159, 236, 255

Heat Treating Equipment & Supplies 91, 198, 200, 209, 260, 262

Hones 199, 266

Honing Machines 108, 199, 266

Hydraulic & Pneumatic Parts & Equipment 85, 88, 97, 203, 224, 235, 247

Jig Borers 103, 287

Lathes, Automatic 59, 64, 94, 227

Lathes, Engine 40, 42-43, 44, 55, 62, 91, 193, 225, 248, 285

Lathes, Turret 22-23, 40, 64, 78, 92

Lubricants, Cutting Fluids, Quenching Oils & Solvents 36-37, 67, 68, 69, 164, 166, 211, 220, 262

Lubricating Systems & Equipment 70, 212

Marking Machines, Tools & Supplies 246, 262

Materials, Cutting & Forming 41, 202, 216, 231, 250, 253

Materials of Manufacture 54, 84, 160, 162, 181, 195, 213, 263, 292

Materials Handling Equipment 228, 268, 290

(Continued on page 287)

Index of PRODUCTS ADVERTISED

In This Issue

Mechanical Parts & Equipment 234

Millers, Die Sinkers, Profilers 8-9, 20-21, 258

Motors, Electrical 26-27

Packaging 258

Planers 14-15, 110

Power Transmission 16, 51, 237

Presses, Forging & Forming Equipment & Supplies 46-47, 50, 72-73, 97, 120, 185, 197, 208, 228, 231, 242, 246, 250, 252, 257, 259, 265, 266, 287, 288

Production, Inventory & Tool Control 230

Pumps, Circulating 214, 247

Riveting Machines 242

Saw Blades 58, 86

Screw Machines; Chucking Machines 3rd Cover, 22-23, 35, 59, 60, 221, 232

Shapers, Slotters, Keyseaters 120, 252

Shop Furniture 256

Special Machine Tools 76-77

Spindles, Machine 266

Stampings 260, 262

Tapping Attachments 236, 255

Tapping Machines 52-53, 56-57, 221

Thread Cutting Machines 10-11, 100, 159

Thread Rolling Machines & Tools 226

Tools, Cutting 10-11, 23, 24-25, 38-39, 63, 65, 66, 75, 80, 95, 98, 106, 112-113, 117, 202, 204, 215, 216, 222, 229, 244, 260, 264, 266

Tools, Hand 86

Tools, Portable 95

Universal Joints 252

Used & Surplus Equipment 272-284

Welding & Cutting, Brazing & Soldering Equipment & Supplies 198, 209, 218, 239

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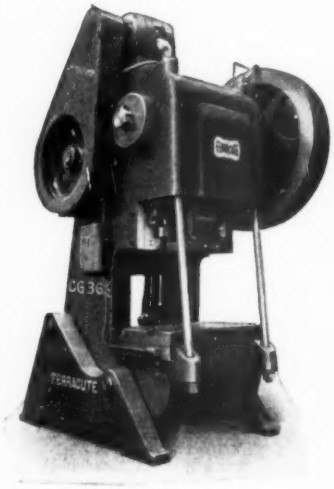

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ADVERTISERS INDEX

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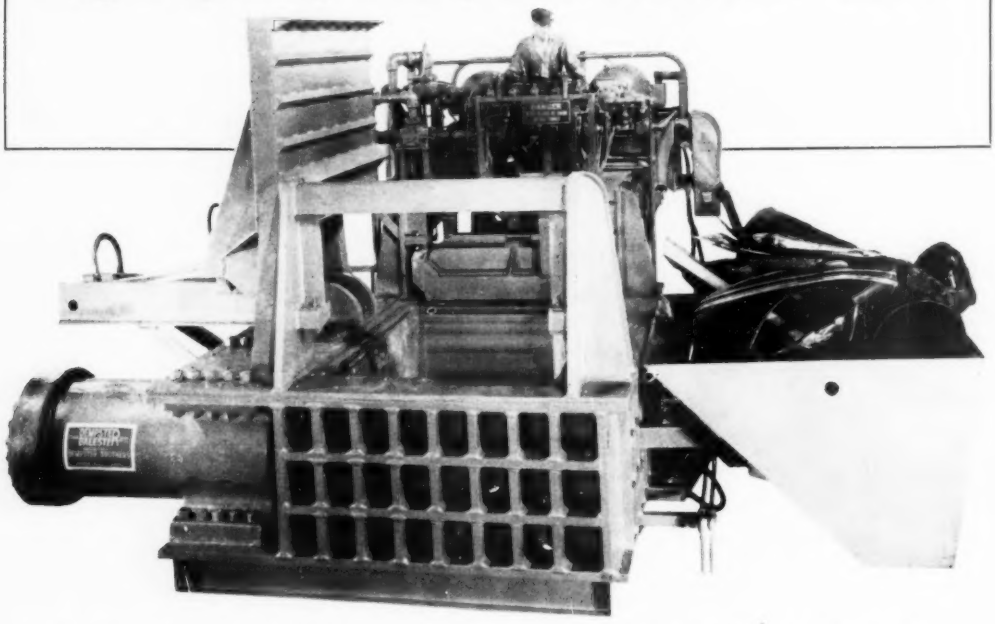
	Page
Abrasive Machine Tool Co.	246
Acromark Co.	262
Adamas Carbide Corp.	216
Allegheny Ludlum Steel Corp.	292
Allen Mfg. Co.	249
Allis-Chalmers Mfg. Co.	51
American Broach & Machine Co.	66
American Gas Furnace	262
American Steel Foundries, King Machine Tool Div.	104
American Tool Works	29
Ames Precision Machine Works	214
Anderson Oil Co., F. E.	166
Armco Steel Corp.	160
Armstrong-Blum Mfg. Co.	58
Armstrong Bros. Tool Co.	75
Arter Grinding Machine Co.	256
Atlas Chain & Mfg. Co.	237
Atlas Press Co.	257
Avey Drilling Machine Co.	114
Barrett Co., Leon J.	242
Bay State Tap & Die Co.	222
Behr-Manning Corp.	32
Bellows Co.	85
Bethlehem Steel Co.	41
Bijur Lubricating Corp.	212
Bilgram Gear & Machine Co.	254
Blanchard Machine Co.	90
Bliss Co., E. W.	46-47
Brown & Sharpe Mfg. Co.	63
Bryant Machinery & Engineering Co.	44
Bullard Co.	78
Bunting Brass & Bronze Co.	54
Carboloy Co., Inc. (General Tools)	112-113
Carborundum Co.	79
Carlton Machine Tool Co.	99
Carpenter Steel Co.	250
Cincinnati-Bickford Tool Co.	103
Cincinnati Gear Co.	254
Cincinnati Grinders Incorporated	4-5
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	120
Cleveland Industrial Tool Co., Inc.	266
Cleveland Twist Drill Co.	80
Coffing Hoist Co.	268
Columbia Die Tool & Machine Co.	246
Cone Automatic Machine Co.	35
Consolidated Machine Tool Corp.	89
Continental Tool Works Div. (Ex-Cell-O Corp.)	106
Cosa Corporation	189
Cro-Plate, Inc.	211
Crucible Steel Co. of America	253
Curtis Universal Joint Co.	252
Cushman & Denison Manufacturing Co.	246
Danly Machine Specialties, Inc.	72-73
Davis & Thompson Co.	286
Davis Keyseater Co.	266
Dayton Rogers Mfg. Co.	260
Delta Power Tool Div. Rockwell Mfg. Co.	95
Dempster Brothers, Inc.	290
Denison Engineering Co.	185
Detroit Broach Co.	117
Disston & Sons Inc., Henry	86
DoAll Co.	261
Dow Corning Corp.	162
DuPont de Nemours & Co., Inc., E. I. (Electrochemicals Dept.)	69
Eagle Picher Sales Co.	244
Earle Gear & Machine Co.	254
Eastern Machine Screw Corp.	260
Eastman Kodak Co.	245
Electro-Lift, Inc.	228
Ellstrom Standard Div. Dearborn Gage Co.	191
Errington Mechanical Laboratory	255
Ex-Cell-O Corporation	106
Farrel-Birmingham Co., Inc.	74
Fellows Gear Shaper Co.	6-7
Ferracute Machine Co.	288
Fiske Bros. Refining Lubriplate Div.	262
Fosdick Machine Tool Co.	61
Frasse & Co., Inc., Peter A.	213
Gallmeyer & Livingston Co.	243
Gardner Machine Co.	17
Gear Specialties, Inc.	71
General Electric Co., X-Ray Dept.	30
Geometric Tool Co.	33, 34
Gerotor May Corp.	247
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	10, 64
Gleason Works	3
Globe Gear Co.	254
Gotham Tool Co.	98
Goss & de Leeuw Machine Co.	232
Grant Mfg. & Machine Co.	242
Gray Co., G. A.	110
Greenfield Tap & Die Corp.	33, 34
Greenlee Brothers	221
Grip Nut Company	265
Grob Brothers	242
Hammond Machinery Builders, Inc.	250
Hanna Engineering Works	235
Hardinge Brothers, Inc.	81
Heald Machine Co.	2nd Cover
Henry & Wright Div. Emhart Mfg. Co.	266
Hones, Inc., Charles A.	266
Jacobs Mfg. Co.	96
Jarvis Co., Charles L.	204
Johnson Gas Appliance	198
Jones & Lamson Machine Co.	65
Kasenit Company	260
Kearney & Trecker Corp.	20-21
Kennametal Inc.	202
Kent-Owens Machine Co.	82
King Machine Tool Div. American Steel Foundries	104
Kingsbury Machine Tool Corp.	56-57
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LeBlond Machine Tool Co., R. K.	42-43
Lees-Bradner Co.	100
Leland-Gifford Co.	179
Lewthwaite Machine Co., T. H.	250
Lincoln Engineering Co.	70
Link-Belt Co.	16, 31
Linley Brothers Co.	287
Lipe Rollway Corp.	238
Lodge & Shipley Co.	94
Logan Engineering Co., Lathe Div.	225

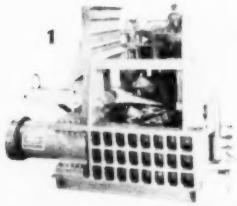
You Can Save Thousands of Dollars In Installation Cost Alone With the Big Capacity Dempster-Balester "600"



Installation expense of a big capacity scrap metal baling press need no longer be a costly item running into several thousand dollars. On the Dempster-Balester "600" all hydraulic assemblies are integral to the machine itself. The "600" is self-contained, requiring no air compressors, springs, counter-weights or supplementary equipment for its operation. Therefore, only a simple foundation and small pit for ejector are required. In many cases, the "600" has been assembled and in operation in three to four days after arrival. This mighty "600" turns out high density 16"x18"x35" bales at the rate of 6 to 7½ tons per hour. This rate is increased by a conservative 25% with Auxiliary Compression Door.

Photos below show the complete baling cycle of the Dempster-Balester "600" with Auxiliary Compression Door . . . offering you the nearest thing available to automatic baling! 1—Skip Pan dumps scrap metal into charging box. 2—Compression Door compresses scrap with a 45-ton force plus the 4500 pound weight of the door and Skip Pan returns for reloading. 3—Compression Door returns to up-right position while scrap is baled. Then finished bale, weighing between 600 and 1,000 lbs., is ejected. Write today to Dempster Brothers, Inc. for folders on the complete line of Dempster-Balester Presses!

1



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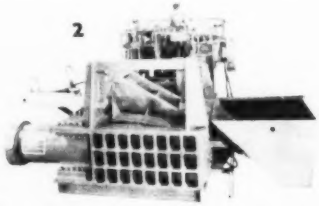
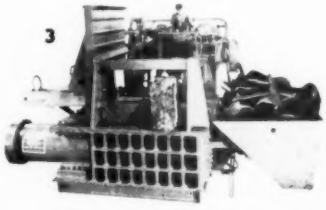


3



DEMPSTER BROTHERS, 4111 Dempster Bldg., Knoxville 17, Tennessee

ADVERTISERS INDEX

	Page
Lovejoy Tool Co., Inc.	229
Lubriplate Div. Fiske Bros. Refining	262
Lucas Machine Division, New Britain Machine Co.	187
Luers, J. Milton	260
Magnus Chemical Co.	205
Mahon Co., R. C.	218
Maschinenfabrik, Lorenz, A. G.	251
Master Mfg. Co.	234
McCaskey Register Co.	230
McGill Mfg. Co.	206
McGraw-Hill Book Co., Inc.	262
Meisel Press Mfg. Co.	254
Metal Carbides Corp.	231
Micromatic Hone Corp.	108
Miller Motor Co.	224
Mitts & Merrill	252
Monarch Machine Tool Co.	55
Morey Machinery Co., Inc.	92, 260
Morris Machine Tool Co.	118
Morse Twist Drill & Machine Co.	24-25
Mueller Brass Co.	84
Murchey Machine & Tool Co.	159
National Acme Co.	60
National Automatic Tool Co.	52-53
National Broach & Machine Co.	241
National Machinery Co.	197
National Machine Tool Co.	258
National Twist Drill & Tool Co.	39
Neise, Karl A.	264
Nelco Tool Co.	244
New Britain Gridley Machine Co.	3d Cover
Nilson Machine Co., A. H.	265
Norton Co.	18-19, 48-49
Oakite Products Inc.	93
Ohio Crankshaft Co.	91
Oliver Instrument Co.	210
Orban Co. Inc., Kurt	264, 268
Osborn Mfg. Co.	83
Ottemiller Co., Wm. H.	266
Parker-Kalon Corp.	207
Philadelphia Gear Works	233
Pope Machinery Corp.	266
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	59
Pratt & Whitney Div. Niles-Bement-Pond Co.	87
Procunier Safety Chuck Co.	236
Radio Corp. of America	209
Rathbone Hair & Ridgway Box Co.	258
Reed Rolled Thread Die Co.	226
Republic Steel Corp.	263
Revere Copper & Brass Inc.	181
Reynolds Metals Co.	195
Rivett Lathe & Grinder Inc.	62
Rodgers Hydraulic Inc.	208
Ross Operating Valve Co.	88
Rotex Punch Co.	252
Ruthman Machinery Co.	214
Scherr Co. Inc., George	250
Schrader's Son, A.	203
Sciaky Bros. Inc.	239
Sebastian Lathe Div. of Metalcrafts Inc.	248
Seneca Falls Machine Co.	227
Sheffield Corp.	159
Sheldon Machine Co.	285
Shore Instrument & Mfg. Co. Inc.	228
Sidney Machine Tool Co.	193
Simonds Abrasive Co.	196
Sinclair Refining Co.	36-37
Snyder Tool & Engineering Co.	76-77
Sperry Products Inc.	248
Springfield Machine Tool Co.	44
Standard Oil Co. (Indiana)	67, 68
Standard Pressed Steel Co.	256
Strong Carlisle & Hammond Co.	228
Stuart Oil Co., D. A.	220
Sunnen Products Co.	199
Sun Oil Co.	164
Surface Combustion Corp.	200
Timken Roller Bearing Co.	4th Cover
Tipaloy Inc.	198
Torrington Co.	267
Tube Making Machines, Ltd.	287
Unitcast Corp.	240
Universal Engineering Corp.	215
V & O Press Co. Div. Emhart Mfg. Co.	266
Van Keuren Co.	45
Van Norman Co.	8-9
Veeder-Root Inc.	28
Verson Allsteel Press Co.	259
Wales-Strippit Corp.	201
Walker Co. Inc., O. S.	266
Waltham Machine Works	242
Warner & Swasey Co.	22-23
Watson Stillman Co.	97
Westinghouse Electric Corp.	26-27
White & Bagley Co.	211
Wilson Co., K. R.	56
Wilson Mechanical Instrument Co.	211
Winter Brothers Co.	38
Zeh & Hahnemann Co.	228

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT — Page
- Positions Vacant 269
- Positions Wanted 269
- Employment Services 269

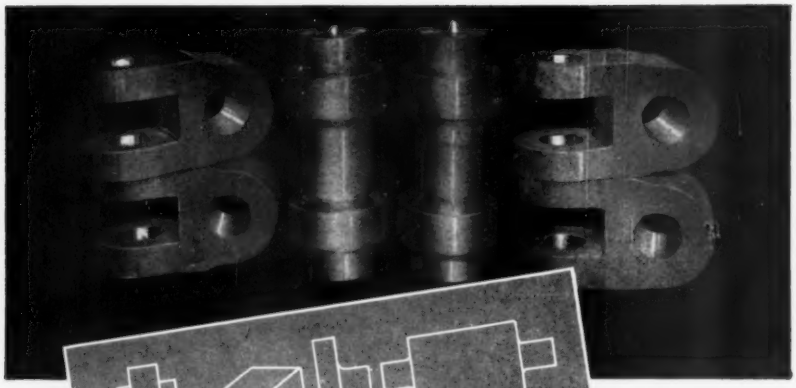
SPECIAL SERVICES
- Contract Work 269
- A. T. Company 269
- Arrow Safety Device Co. 269
- General Pattern Works 269
- Sier-Bath Gear & Pump Co., Inc. 269
- Rebuilding 270-271

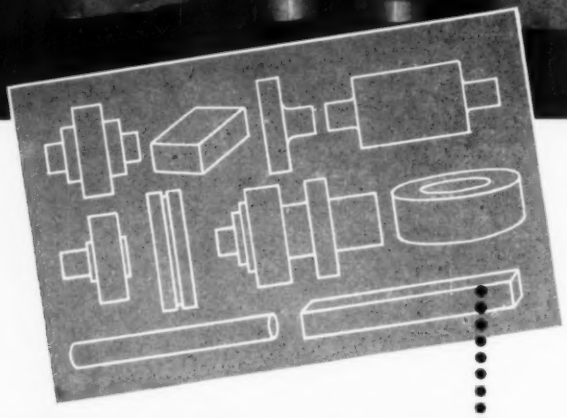
EQUIPMENT
- (Used or Surplus New)
- For Rent 284
- For Sale 272-284

WANTED
- Equipment 269

ADVERTISERS INDEX

Aaron Machinery Co. 275
Alexander & Fiden Machy Co., Inc. 278, 280
Bennett Machinery Co. 278
Botwinik Bros., Inc. 280
Botwinik Bros. of Mass., Inc. 284
Brownell Machine Tools, Inc., Hazard 280
Bullovak Eqpt. Div. of Blaw-Knox Co. 283
Capitol Machinery Corporation 284
Chicago's Machinery Exchange 269
Cincinnati Machinery Co. 282
Cowden Machinery Co., W. C. 283
Cox Machinery Co., Inc. 274
Currier Machine Sales 283
DeWitt Tool Co. 269
Donberg & Dardis 282
Dony Machinery Co., D. E. 282
Eastern Machinery Co. 276
Electric Drain Cleaning Co. 269
Emerman Machinery Corp. 283
Falk Machinery Co. 273
Goldman & Co., Harvey 274
Green Bros. of Worcester, Inc. 282
Hill-Clarke Machinery Co. 279
Hyman & Sons, Joseph 283
Indianapolis Machinery & Supply Co. 276
Kings County Machinery Exchange 278
Lake Machinery Co. 272
Latch Machinery & Supply Co. 280
Lurie Brothers & Company, Inc. 278
Mac Dell Corporation 278
Miles Machinery Co. 280
Morey Machinery Co. 277
National Machinery Exchange 280
O'Connell Machinery Co. 284
Osborne & Sexton Machinery Co. 276
Paul's Machinery Co. 272
Portland Mach. Tool Rebuilders, Inc. 270, 271
Segal Machinery Company 283
Triplex Machine Tool Corp. 281
Victor Machinery Exchange, Inc. 284
West Penn Machinery Co. 282
Winston Machinery Company, Inc. 283
Wigglesworth Industrial Corp. 284





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How to help a spindle carrier deliver precision

WITH six work spindles in its spindle carrier, the Greenlee automatic screw machine, shown below, can perform six cutting operations simultaneously. To maintain precision in each operation, all work spindles are mounted on Timken® tapered roller bearings.

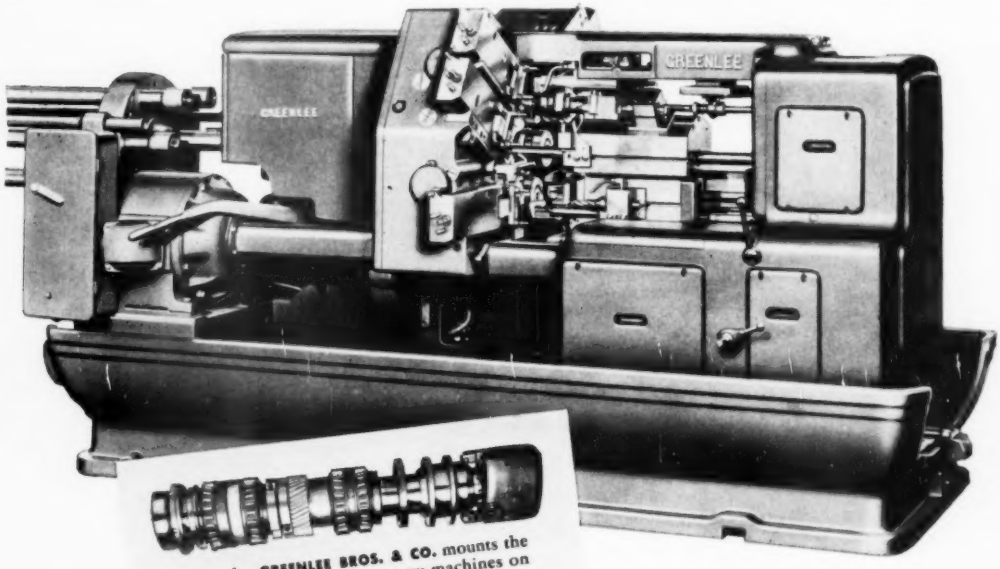
Timken bearings help eliminate spindle chatter. Work turns smoothly and accurately. Set-ups stay set. Greenlee Bros. & Co. also use Timken bearings in the gear box to provide a smooth flow of power through a wide range of speeds and feeds.

Because of tapered construction, Timken bearings take both radial and thrust loads in any combination, hold spindles in proper alignment. Line contact between rollers and races provides extra load-carrying capacity. The true rolling motion and incredibly smooth surface finish of Timken bearings practically eliminate friction.

Since Timken bearings are engineered for the job, precision manufactured and made of special analysis Timken fine alloy steels, they normally last the life of the machine.

No other bearing can give you all the advantages you get with Timken tapered roller bearings. Make sure you have them in every machine tool you build or buy. Look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How the **GREENLEE BROS. & CO.** mounts the spindles of its automatic screw machines on Timken bearings to insure lasting precision.

FINISHED TO CLOSER TOLERANCES

Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

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